American Machinist

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What are the reasons for replacing obsolete equipment?
How soon should new equipment pay for itself?
What are the steps taken in buying equipment?
Is group or individual motor drive preferable?
Is a repair cost record worth while?
How are obsolete machines disposed of?
What are the faults of machine tools?
How keep informed of developments in equipment?

Conclusive answers to these questions are of extreme importance to the user of shop equipment. The answers have been given in the *American Machinist* in its series of articles, "Getting the Most Out of Your Machine Tool Dollar." But not all of the leaders of the machinery industries think alike on such subjects and the problems are likely to require different answers in different plants. Therefore cross-sections are presented here of the articles as a whole, the statements of company policies being quoted or abstracted, as they apply to the several questions.

In this article, the SEVENTH *of a series of eight, answers are given to the question*

What Are the Faults of Machine Tools?

International Harvester—Criticisms by the International Harvester Co. point out the following shortcomings of machine tools:

Loose-pulley bearings that need improvement. Many loose-pulley bearings are being replaced by pulleys with inserted ball-bearing sleeves.

Bearings that are too small.

Locking devices that do not lock.

Tables lighter than desirable on drilling machines.

Lack of a mechanical method of moving the arms of radial drills, especially when the drill is almost, but not quite, over the bushing.

Lack of fly-wheels to absorb shock.

Inefficient oiling systems.

Lack of flexible mounting of driving pulleys that would make a machine capable of being fitted into line manufacture whether set parallel or at a right angle to the line.

Lack of uniformity in the heights of machine tables.

Excessive chatter.

SKF Industries—Some difficulties with new machines have been experienced by SKF Industries: "Many times we have had to make adjustments and corrections on machine tools to hold the accuracy of product that we must have. We have even gone so far as practically to rebuild machines. Apparently the trouble with them was that they were hurried too much in design and building on account of competitors' machines. Our experiences have led us to hope for an improvement in standards of workmanship on machine tools. . . . Troubles arise from poor design and from wrong selection of materials."

Delco—From the point of view of the Factory Manager of Delco (Dayton Engineering Laboratories Co.), the shortcomings of machine tools are few, "and it must be kept in mind that the criticisms are based on experience with a specific kind of product. Ninety per cent of the machine tools have too wide a range—too many feed gears and too many changes of speed, and there is not enough oiling capacity, by which I mean that they must be oiled too frequently."

The Hoover Co. does not always find bearings all they should be. Other things being equal, machines with ball or roller bearings, preferably the latter, are bought. Present-day multiple-operation machines are found to require too long a time for indexing. Slides are found to be too short on some machines, giving too little

wearing surface. The knee is apparently too light on some milling machines. Punch presses could be of heavier design. On some machines collets are too light to hold cutting tools heavy enough to do all of the cutting that could be done. On many machines a shear pin should be provided; and on others the shear pin should be closer to the work. The company has adopted the Alemite system, or automatic lubricating devices, on practically all machines.

Timken—Poor selection of material is the strongest criticism of the Timken Roller Bearing Co. Frequently it has been possible to reduce maintenance cost by the replacement of some cast-iron parts by parts made of cast steel.

General Electric—From the point of view of a large manufacturer, the General Electric Co. finds that, in general, machine tools cover too wide a range in their speed and feed variations and believe that on the production job it is often more desirable to have simplified geared headstocks, etc. The usually complicated nest of gears is reduced to a minimum of parts, and sources of trouble are correspondingly reduced. The same company finds "neglect in providing an oiling system that actually supplies oil to the points where it does some good."

The Morgan Construction Co. does not find the working heights of machine tools all they should be. The Vice-President says, "We have set large planers and boring mills so low that the operators can step easily from the floor to the tables.

"The proper height of a table is the height at which the operator can do his work with the least effort and with the least danger. Platforms and steps are far from desirable, because of risk and fatigue to operators, difficulty in cleaning, bad appearance, and reduction in output. Especially is this true when an operator tends more than one machine. When operators move from machine to machine, or from shop to shop, working conditions will be more nearly uniform when the table heights of similar machines are the same.

"Many machine tools are designed with the tables too high, especially the larger machines, but the user can almost always remedy the defect without very heavy expense or great alteration, by setting the bases below floor level."

The National Cash Register Co. does not have much unfavorable criticism of machine tools, and believes that much of the discontent concerning shortcomings of machine tools is due to overloading. The company follows a policy of not overloading, and has had the experience that with proper attention to oiling and maintenance, the equipment will give all the service that should be expected.

Western Electric—Standard machines are seldom capable of operating at speeds as high as desired at the Hawthorne Works of the Western Electric Co. with the consequence that it is sometimes necessary to build special spindles. This company believes that the design of punch presses can be greatly improved, pointing out how its own presses are equipped with friction wheels to drive against the inside of the rim, and with soft brass wire shear rings in the connection between the screw and pitman. Overloading the press will cause the friction wheel to slip, and double-heading or other interference with press action will cause the wire safety ring to shear.

Chrysler—In the opinion of the Chrysler Corporation there still is opportunity for improvement in the average machine tool in the elimination of cast-iron gears, cams and other parts subject to stresses and wear far beyond the capacity of soft iron. Likewise improvement can be made by the use of anti-friction bearings instead of bronze in many instances. Lubricating systems on many machine tools are antiquated, the development in the direction of a central circulating oil system having been extremely slow.

Hupp—According to the Hupp Motor Car Corporation most of the troubles of machine tools can be traced back to insufficient lubrication, although it is admitted that it is impossible to lubricate some of the bearings used, even in standard machines. Another important cause of machine failures pointed out is carelessness on the part of the operator.

Training Draftsmen

By John F. Hardecker

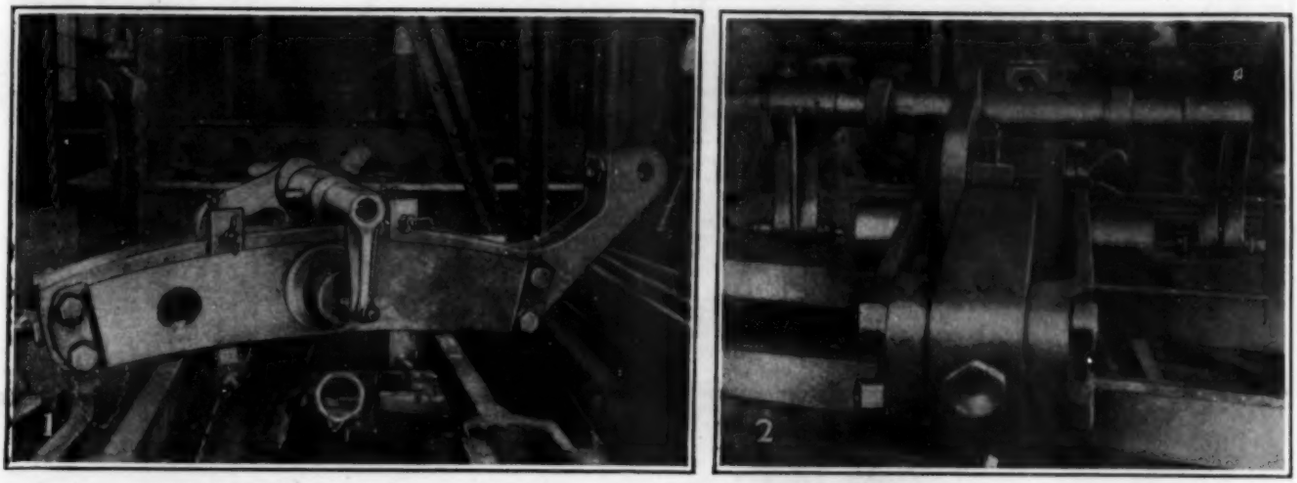
"SAY, Jack," remarked Bill Smith to his old chum and fellow chief draftsman, "I met Ed. Jones going out on the train last night. I was naturally curious about his start in the aeronautical game, so I inquired about it. Ed. confessed it was none too brilliant, since following the Eagle Company's usual practice, he was set directly to detailing under a squad leader. The squad leader was so busy in the midst of a rush project, that he had little, if any time to devote to Ed. personally. In fact, the whole squad was so feverishly busy, that Ed. felt he was a liability rather than an asset to them. He was just about ready to give up the ship at one time, for while no one complained about his work, he was woefully at sea as to what it was all fundamentally about. But by sticking to it, he finally mastered it and came out on top in the long run."

"Well," asked Jack, "now that Ed. is the chief, has he made it any better for a new man breaking into the aeronautical game?"

"That's what I'm coming to," replied Bill. "I believe he has. To begin with, he assigns the new draftsman, not to a busy squad leader, but to one of the older draftsmen direct. He usually selects a man who is quite familiar with aircraft in general, and particularly with the company's drafting system. Then in order to impress upon the new man the importance of its standards, he lets him spend the first day reading through them. He does this more with the idea of creating in the new man's mind an automatic dependence on the standard book, than in the hope of what he'll actually get out of it the first day.

"His first few week's work are usually on changes. This is to give him as broad a survey of aircraft as possible, right at the start. The instructing draftsman goes into full detail with him as to just why each drawing change is being made, and the necessary procedure for completing the routine of each change. Then he is set at detailing, still under his instructing draftsman, and only after about six weeks is he released directly to the squad leader.

"It looks to me as though the new draftsman catches on very quickly that way."



Figs. 1 and 2—Fixture for drilling center holes in reverse-link trunnions set up on a link

Southern Pacific Methods at the Los Angeles Shops

By L. C. Morrow
Managing Editor, American Machinist

Fixture used in drilling the center holes in reverse-link trunnions—Special wedge block in rod ends—Machining rods, links, and driving-box brasses—Facing car brasses

IN THE shops of the Southern Pacific at Los Angeles, Calif., are to be found many of the tools accepted in common practice by most railroad shops, and some of which are illustrated in this article. There are, however, several devices of the shop's own design that are individual in character, and it is to those devices that the article is particularly pointed. For example, the tool illustrated in Figs. 1 and 2 has been devised to drill the center holes in reverse-link trunnions, to insure that the holes will be perpendicular to the faces of the link. The bar that carries the drills also carries a plate, the face of which is perpendicular to the axes of the center drills. It is by this plate, which is clamped against the face of the link, that the drills are located. Power to do the drilling is supplied by an air motor. Form-milling is not common in railroad shops, yet obviously the best way to machine the engine-truck spring link is by using a form cutter as shown in Fig. 3. The method of supporting and clamping the link is very simple. Although it cannot be classed as a tool or fixture, the wedge block, Figs. 4 and 5, is an economical device. Ordinarily the liners between the wedge and brass will, in many miles of travel, wear grooves of serious proportions in the rods on the lower side. The wedge block referred to, on account of the lug, on which the liner rests, takes that wear, protecting the rod. It is not costly to replace the wedge block, but even that is not necessary, since a new lug

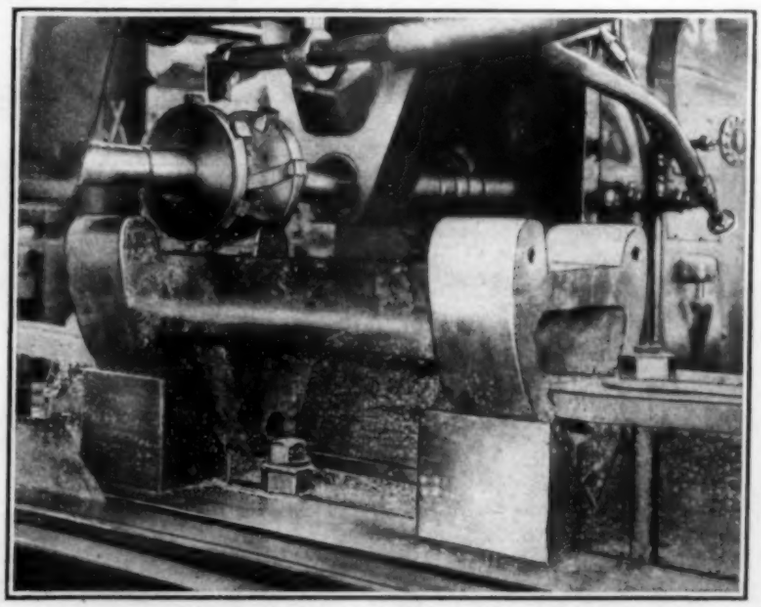
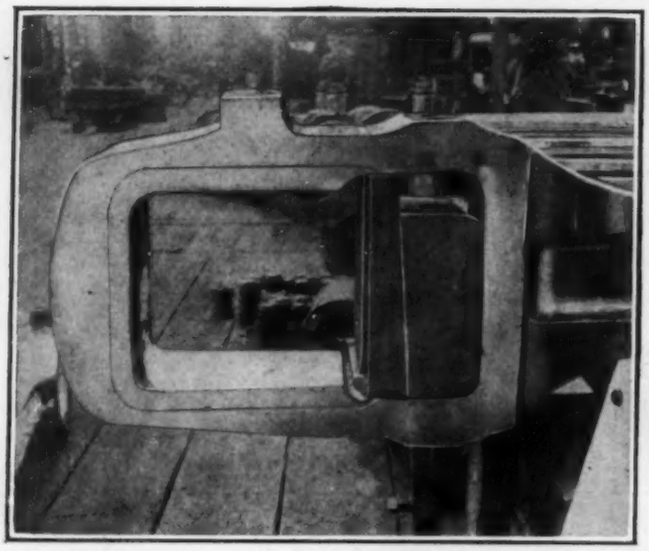


Fig. 3—Form-milling engine-truck spring links



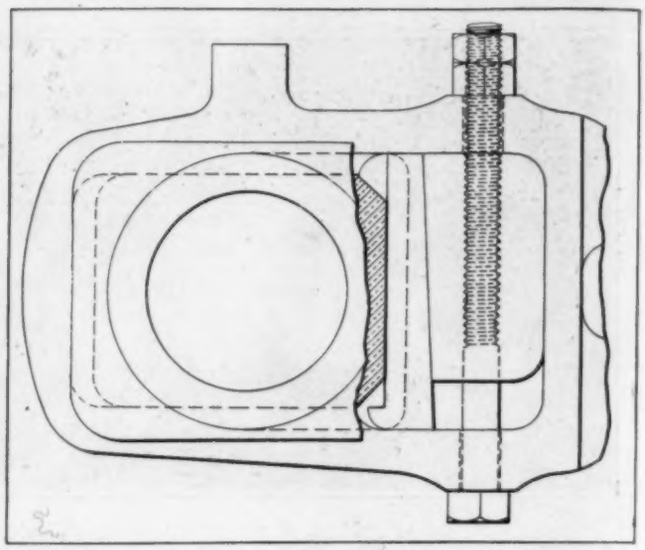


Fig. 4—Wedge block with welded lug to prevent the wearing of a groove in the rod by pounding of the liner
Fig. 5—Application of wedge block with welded lug

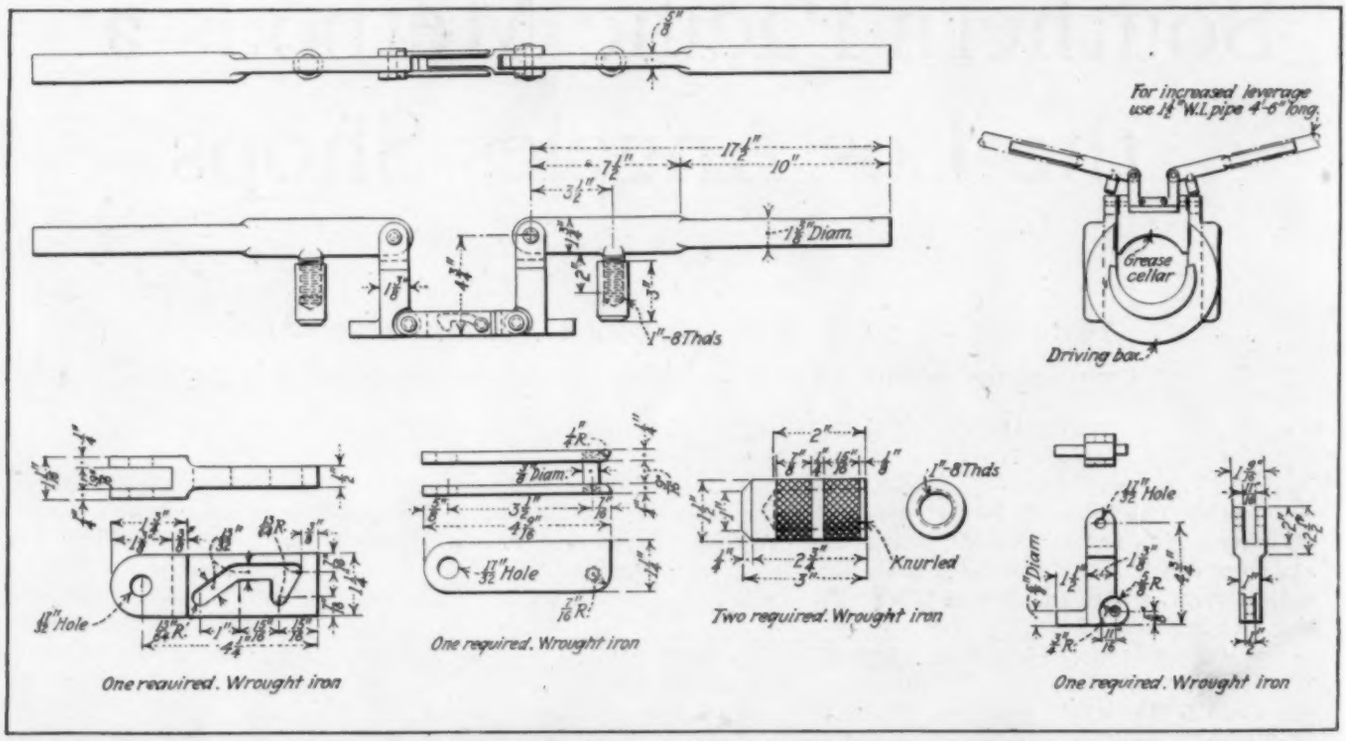


Fig. 6—Assembly and details of cellar puller

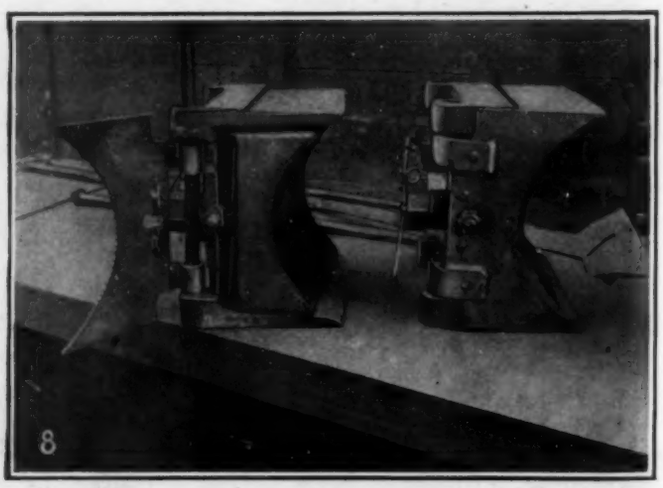


Fig. 7—Cellar puller applied to cellar. *Fig. 8—Covers on driving-box cellars*

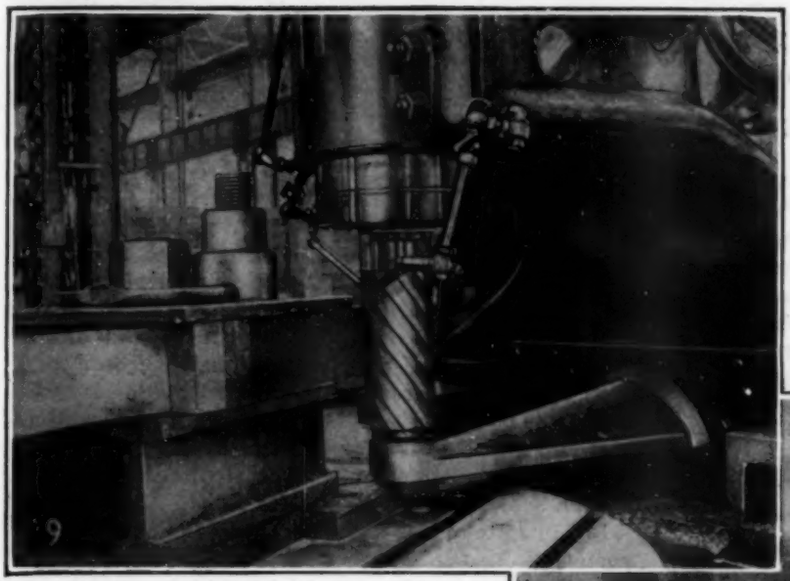


Fig. 9—Milling rods

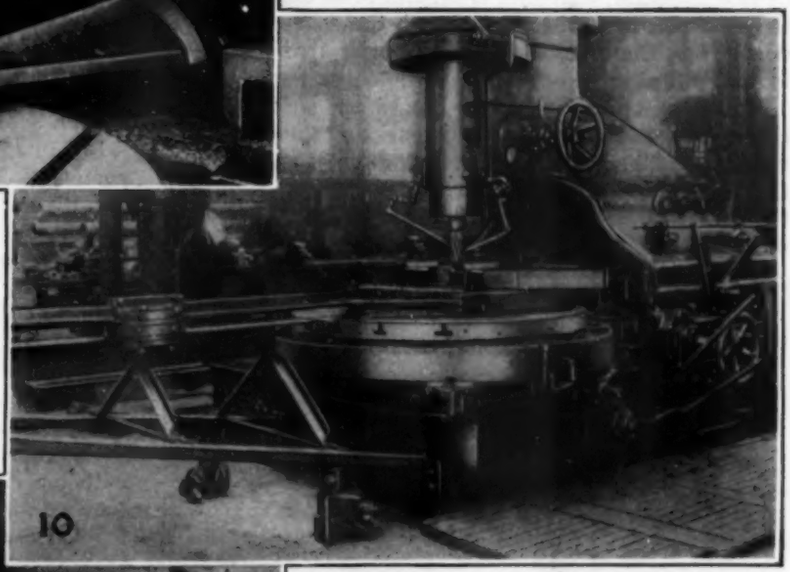


Fig. 10—Milling reverse links, using radius-bar attachment

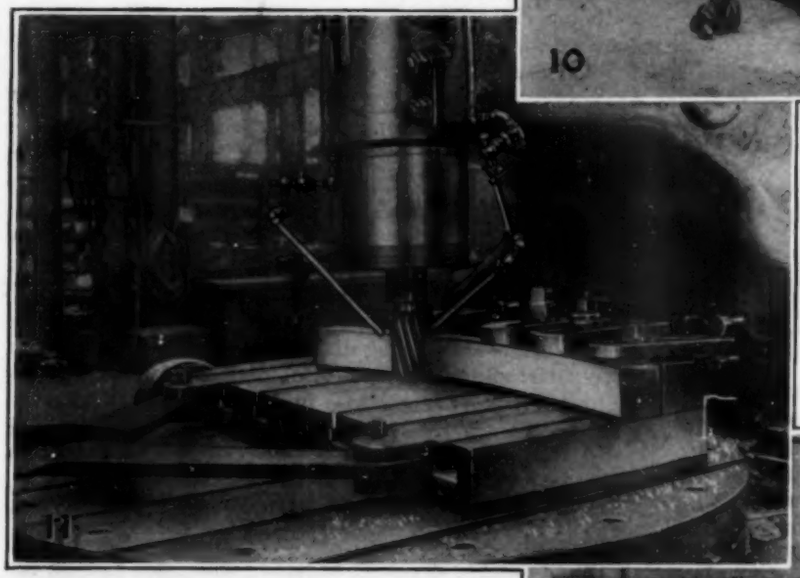


Fig. 11—Milling link blocks

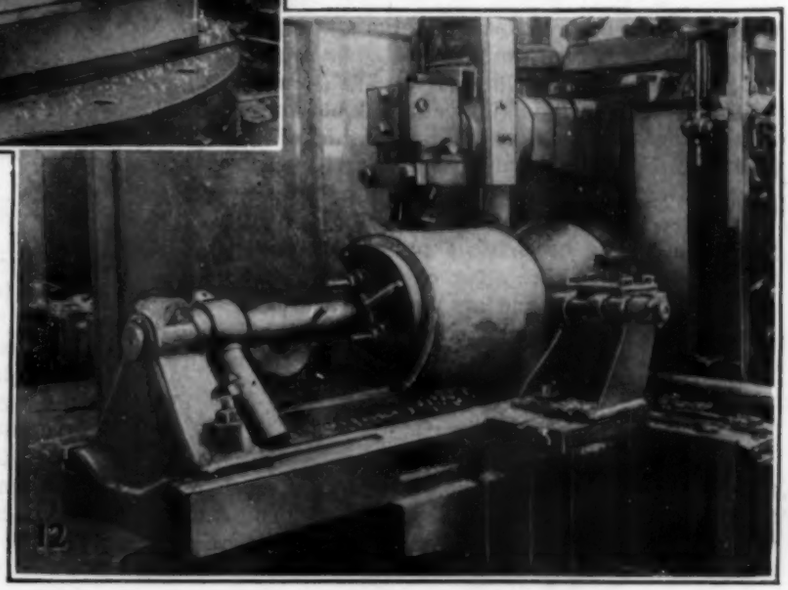


Fig. 12—Machining driving-box brasses on the draw-cut shaper

can be welded on in place of one that is worn. In fact an old wedge block can be converted into a block of the type described merely by welding on a lug.

The cellar puller, Figs. 6 and 7, is a time- and labor-saving tool. The methods of application and operation are evident from the illustrations.

Cellars give trouble in service as well as offer difficulties in being removed from driving boxes. The sheet steel cover illustrated in Fig. 8 is now being used by the Southern Pacific. It has the advantage of being unbreakable and of being hinged to the cellar casting. Since it is not removed from the cellar during inspection and filling, it is never lost. Should it be left open by one inspector, that fact is certain to be discovered by the next, because when not closed, the cover will hang down from the axle, thus giving notice that the cellar is not protected.

It will be noticed that the hinges are welded to the covers, and that the lugs on the backs of the covers are welded on. The function of these lugs is to bear against the cellar casting, so that when the nut is tightened the cover will not be bent. There is other welding done on cellars at times, in building up. The ordinary procedure is to preheat the cellar, tin it, and pour on melted bronze. In emergencies, or on small lots, however, building up is done by means of the gas torch.

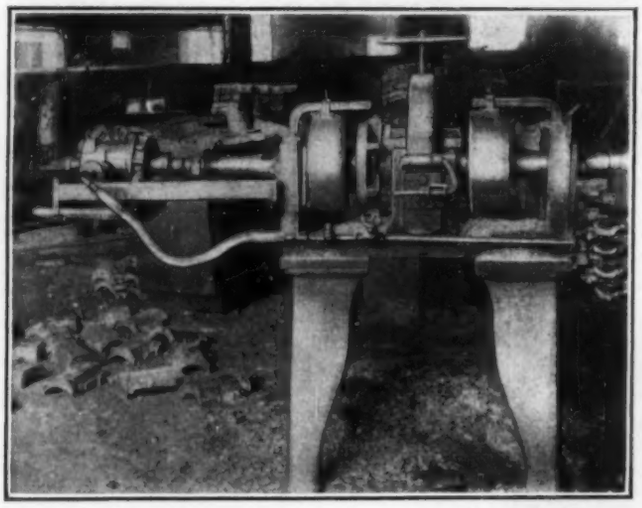


Fig. 13—Air-driven machine used to face car brasses

Some of the "common practice" jobs, mentioned in the first paragraph of the article, are shown in Figs. 9, 10, 11 and 12. Rods, links and link blocks are milled on the Ingersoll vertical machine, which is equipped with a radius attachment, and driving-box brasses are machined on the Morton draw-cut shaper.

Car brasses are faced on the machine shown in Fig. 13, which has as its driving unit an air motor. The brasses are located with a lug, cast on the brass, against a pin of the fixture and are held by a hinged clamp. The heads are adjustable along the driving bar and can be traversed in either direction by means of a handwheel. Production is 50 brasses per hour.

While the executive seeks privacy in which to work out his plans, a manual laborer is usually much more contented when he works in gangs or groups. And he probably loses less time in conversation than he does in "grouching" when he is alone.

Seen and Heard

By John R. Godfrey

Using and abusing diamonds

DIAMONDS are coming into use more and more in modern shop work. I find them used in turning hard rubber, fiber and the new molded materials, and in cutting metals of various kinds, from aluminum to cast iron. Years ago I ran across a man who was boring out a hardened steel punching die that had been made with two little clearance for its punch. He also used the diamond tool in something the same way as we do a lap, for sizing holes after hardening. Using diamonds and diamond dust for cutting holes with copper tubes, was an everyday experience with him.

But in spite of our knowledge that diamonds are economical in many places, their use does not grow as rapidly as their advantages seem to warrant. And largely, so one of my diamond-using friends says, because we seem to feel that there's something uncanny about using diamonds.

Instead of considering the diamond we use as a sort of tool tip, as of stellite or some other special metal, we think all we need to do is to stick it in a holder of some sort and go to work, without paying much attention to the real cutting action we get. The cutting edge should, he says, be shaped just as we grind a steel tool, with the right sort of cutting edge, rake and clearance that we give any tool.

Probably the facts that diamonds cannot be ground to shape as readily as steel tools and that it takes special equipment and experience for this work, are responsible for our not getting the best results. But diamonds can be ground without difficulty if we use a wheel of close-grained cast iron and charge it with diamond dust. Copper disks can be used, but the cast iron is said to be better. Some users even import the cast-iron wheels from Belgium, where diamond cutting is one of the standard industries.

It is a mistake to use diamonds that are too small to give satisfactory service. A chip that is approximately $\frac{1}{16}$ in. thick and from $\frac{3}{8}$ to $\frac{1}{2}$ in. long is, according to my diamond-using friend, the best stone to buy. It should be set with the end pointing to the work and embedded in the holder so that it will be supported at a point as near to the cutting edge as possible. A diamond of this kind can be used a long time and can be reset.

Diamonds for dressing abrasive wheels do not, in the opinion of my expert friend, receive the attention they deserve. He says, "We usually take a small diamond, stick it in the end of a holder and move it across the face of the wheel. Because it is a diamond we pay no attention to its shape, depending on its hardness to do the trick.

"The result," he says, "is to only half dress the wheel. You wouldn't expect to get a clean surface with a dull tool of any other kind. If you want a wheel with a sharp corner you want to *cut the grains* of the abrasive, not tear them out of the bond." I'm still quoting: "Grind your wheel-dressing diamond like a lathe tool and you can cut the abrasive grains so as to get a wheel that will grind as sharp a corner as you can cut with a milling cutter."

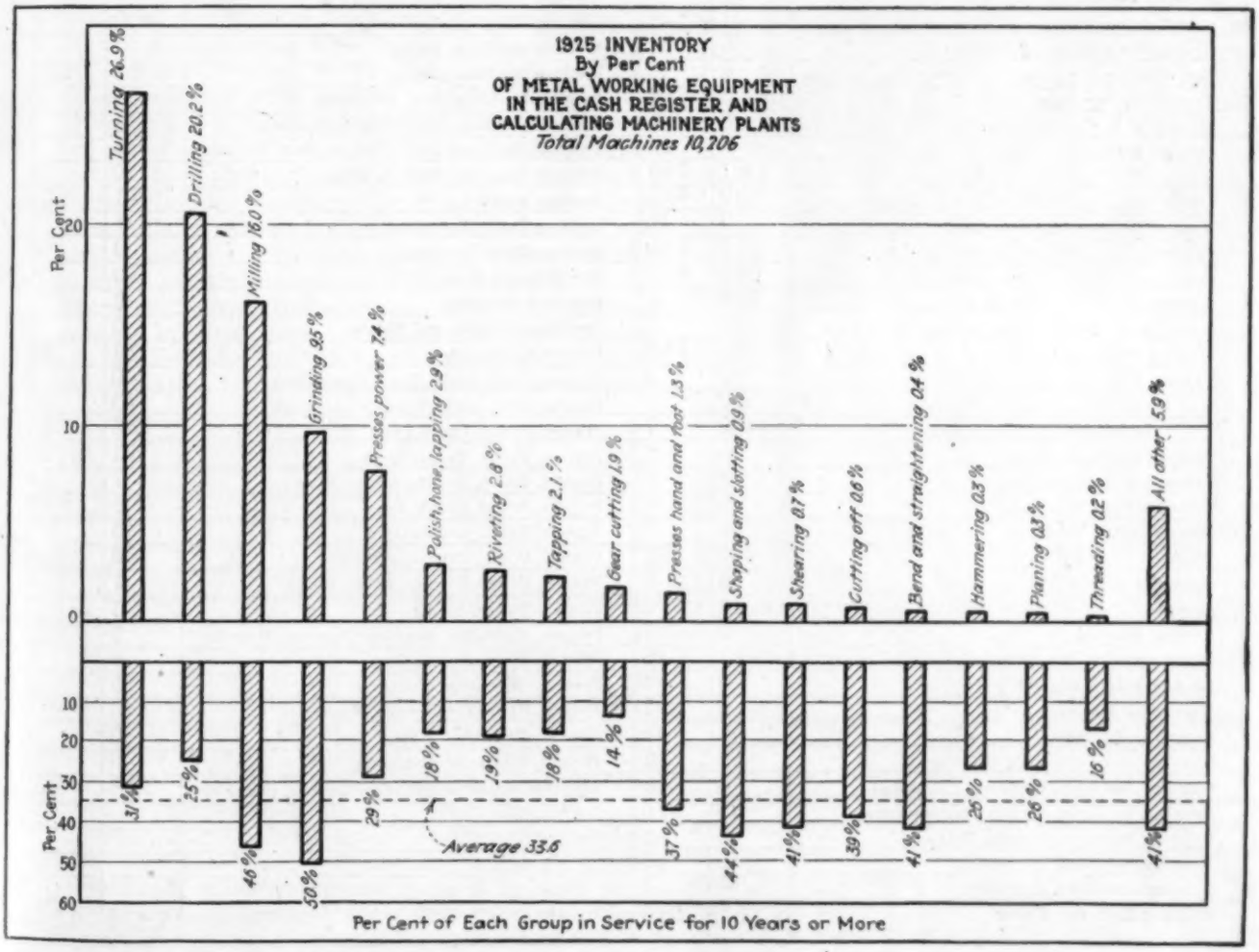
Cash Register Builders Use Up-to-Date Equipment

Only one-third of 10,000 metal working machines over ten years old

THE manufacturers of cash registers and calculating machines are well equipped with comparatively new machinery as compared to other divisions of the metal-working industry. Based on returns from an *American Machinist* questionnaire, approximately one-third of the 10,200 total metal-working machines have seen ten years or more of service. Grinding machinery is the oldest group of the eighteen operation groups shown in chart below. The milling, and shaping and slotting groups are also older than the average of 33.6 per cent. Gear cutting machines are the newest while threading and tapping machines follow quite closely. One out of every four of the drilling machines and one out of every three of the lathes are over ten years old.

The chart shows the relative importance of the groups in terms of per cent of the total as well as the age of each group.

The body of the questionnaire from which the *American Machinist* obtained the inventory data is reproduced on the next page. It is shown filled in with the totals in each division for the industry. These figures were obtained from the actual questionnaire by totaling the returns as to machines and as to the number of men in the plants reporting. These actual figures were then expanded on the basis of the constant relationship between men and machines to the total of 14,958 for men as shown by the 1923 U. S. Census of Manufactures. These men and the machines, also according to the census, are distributed in a total of 32 plants, which employ 6 or more men. Fourteen of these thirty-two each employ more than one hundred men.



METAL WORKING EQUIPMENT IN THE CASH REGISTER AND CALCULATING MACHINE PLANTS

Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925	Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925
Engine Lathes	52	154	Grinding Machines, Floor, No Feed Attachments	198	364
Hand Turret Lathes	40	58	Grinding Machines, Bench, No Feed Attachments	54	110
Power Turret Lathes	4	20	Grinding Machines, Disk	7	61
Semi-Automatic Lathes	2	13	Grinding Machines, Belt	0	12
Hand Screw Machines	73	266	Grinding Machines, Centerless	9	23
Automatic Screw Machines, Single Spindle	231	1246	Polishing and Buffing Machines, Wheel	33	191
Automatic Screw Machines, Multiple Spindle	11	130	Polishing and Buffing Machines, Belt	2	18
Chucking Lathes	0	0	Polishing and Buffing Machines, Semi-Automatic	0	2
Multiple Spindle Chucking Machines, Rotary Work	0	0	Lapping Machines	19	82
Multiple Spindle Chucking Machines, Rotary Tools	0	0	Honing Machines	0	0
Speed Lathes	65	96	Cutting-Off Machines, Parting Tool Type	0	0
Bench Lathes	241	448	Cutting-Off Machines, Power Hack Saw Type	12	28
Tool Room Lathes	135	287	Cutting-Off Machines, Rotary Cold Saw Type	5	19
Wheel Lathes	0	0	Cutting-Off Machines, Band Saw Type	7	14
Axle Lathes	0	0	Cutting-Off Machines, Friction or Hot Saw	0	0
Forge Lathes	0	0	Shears, Knife	14	47
Hand Milling Machines	138	366	Shears, Rotary	5	7
Bench Milling Machines	16	39	Shears, Slitting	7	14
Plain (Knee and Column Type) Milling Machines	459	795	Nibbling Machines	5	18
Universal (Knee and Column Type) Mill. Mach.	56	158	Hammers, Steam	0	2
Vertical (Knee and Column Type) Mill. Mach.	35	61	Hammers, Pneumatic (not portable)	0	0
Lincoln Type Manufacturing Milling Machines	53	107	Hammers, Drop	7	16
Semi-Automatic Type Milling Machines	7	95	Hammers, Helve	0	2
Continuous Mill. Mach. Rotary or Drum Type	0	7	Hammers, Spring	0	7
Planer Type Milling Machines	0	0	Riveting Machines, Pneumatic	4	4
Gear Cutting Machines, Rotary or Milling Type	21	121	Riveting Machines, Hydraulic	0	0
Gear Cutting Machines, Hobbing Type	5	61	Riveting Machines, Steam	0	0
Gear Cutting Machines, Planing or Shaping Type	0	7	Riveting Machines, Power	51	285
Vertical Boring Mills	0	4	Forging Machines, Hot, Bulldozers	0	0
Horizontal Boring Machines	0	2	Forging Machines, Hot, Forging Machines	0	0
Radial Drilling Machines	4	18	Forging Machines, Cold Headers, Bolt, Nut, etc.	0	7
Upright Drilling Machines, One Spindle	67	269	Forging Machines, Cold, Swaging	0	0
Upright Drilling Machines, Two or More Spindles	59	417	Bending Brakes	11	23
Upright Drilling Machines, Two or More Heads	0	26	Bending Rolls, Horizontal	4	9
Sensitive Drilling Machines, One Spindle	198	660	Bending Rolls, Vertical	0	0
Sensitive Drilling Machines, Two or More Spindles	191	670	Straightening Rolls	0	4
Sensitive Drilling Machines, Two or More Heads	0	0	Punching Machines	0	2
Two-, Three- and Four-way Drilling Machines	0	2	Combined Punches and Shears	0	0
Tapping Machines, Single	39	208	Presses, Hand, Arbor	28	95
Tapping Machines, Multiple	0	9	Presses, Hand, Light Punch Press Work	0	7
Pipe Threading and Cutting Machines	0	11	Presses, Foot, Light Punch Press Work	23	35
Bolt Threading and Cutting Machines	0	2	Presses, Power, Crank Type	198	684
Thread Chasing Machines	0	0	Presses, Power, Toggle Type	12	23
Thread Hobbing Machines	0	0	Presses, Power, Double-Acting Type	7	18
Thread Milling Machines	0	4	Presses, Power, Dieing Type	0	2
Thread Rolling Machines	4	7	Presses, Power Automatic	0	5
Planers	7	25	Presses, Power, Trimming Presses	0	4
Open-side Planers	0	2	Presses, Power, Forcing, Arbor, Wheel	4	4
Shapers	31	70	Presses, Power, Baling	0	2
Vertical Shapers	0	5	Presses, Hydraulic, Bending, Forming, Drawing	2	12
Slotters	7	16	Presses, Hydraulic, Forging	0	0
Broaching Machines	0	7	Presses, Hydraulic, Flanging	0	0
Keyseating Machines	0	2	Presses, Hydraulic, Forcing, Wheel, etc.	0	0
Centering Machines	4	7	Presses, Hydraulic, Baling	0	0
Grinding Machines, Plain Cylindrical	35	72	Presses, Hydraulic, Extruding	0	0
Grinding Machines, Universal Cylindrical	35	46	All other machines and miscellaneous, please list:	245	567
Grinding Machines, Surface, Reciprocating	53	110			
Grinding Machines, Surface Rotating	5	18			
Grinding Machines, Internal	5	16			
Grinding Machines, Cylinder	4	7			
Grinding Machines, Cutter	82	130	Total	3,435	10,206

Applying Electrical Equipment to Production Machinery

By Robert Corey Deale
Electrical Engineer, Niles-Bement-Pond Co.

Automatic starters for slip-ring induction motors—Operating characteristics and limitations of various types of manually operated d.c. controllers of the tumbler, dial, and other types

AN AUTOMATIC STARTER for a slip-ring induction motor consists of a contactor for connecting the motor primary leads to the line, other contactors for short-circuiting the secondary resistance in one or more steps and accelerating and overload relays as may be necessary. In Fig. 47 is shown an open controller panel for use with a 50-hp. slip-ring induction motor driving a wheel lathe. The knife switch is for emergency reversing of the driving motor. It is preferable to inclose a panel of this sort. Slip-ring motors are particularly desirable for services in which the motor must be started against heavy loads, or for applications requiring frequent reversal of the motor, and in which the speed variation with load of a high-resistance rotor squirrel-cage motor is undesirable. When used on driving wheel lathes, the controllers are usually arranged so that, upon pushing a slow-down button, resistance is inserted into the secondary circuit, and the motor speed is materially reduced. Thus a hard spot in the work may be cut at a much lower speed, and the motor then returned again to normal speed by releasing the button. The wheel lathe controller shown cuts out the secondary resistor in three steps. It is provided with plunger-type timing relays and plunger overload relays with oil filled dashpots for obtaining inverse-time-limit overload protection.

The motors and controllers described above include all of the generally used types. For special purposes, these simpler types of controllers may be modified or combined to suit the conditions imposed by the machine. It is essential that for such special conditions, the electrical equipment should be laid out by some one having full knowledge of both the machine and the electrical equipment.

Direct current controllers may be divided into the same three general classes as those for alternating current, namely the manual, semi-magnetic and full magnetic controllers. Direct current manually operated controllers may be separated into simple starting switches, such as knife or snap switches; dial and other types of starting rheostats; and drum controllers.

Simple starting switches are customarily used only with fractional-horsepower motors, although heavily compounded or series motors up to 5 hp. may be so started without damage. Even here it is desirable to use a resistor to limit the current peak at starting and so to prevent possible flashing at the commutator. There are various kinds of snap and tumbler switches, one of which is shown in Fig. 48. This switch has three poles and may be used on starting service for either a d.c. or an a.c. motor up to 1 hp. These tumbler switches, when made by a reputable manufacturer, are very satisfactory, but should never be used for larger motors than those for which the switch is recommended by the manufacturer.

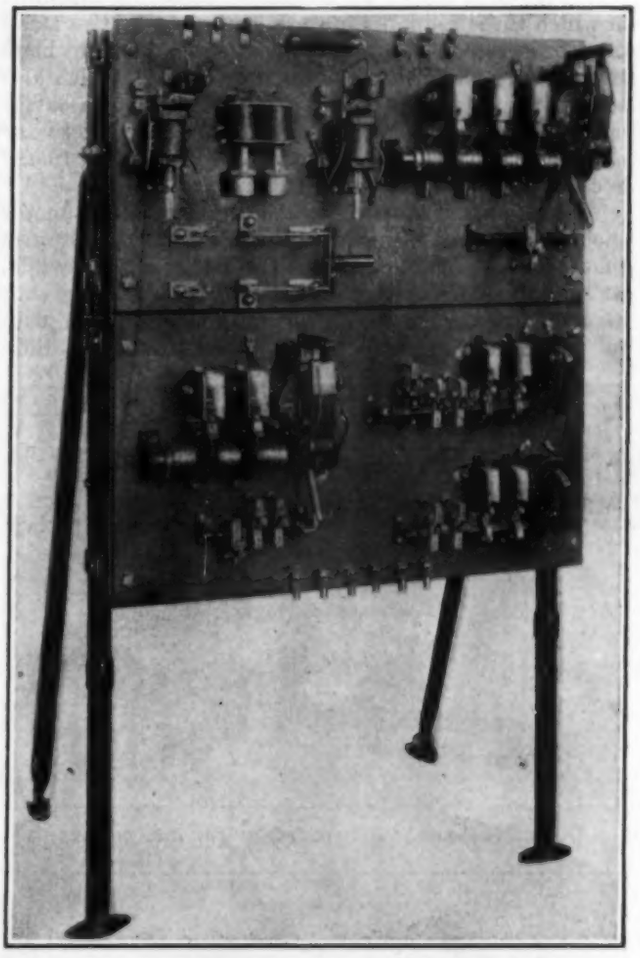
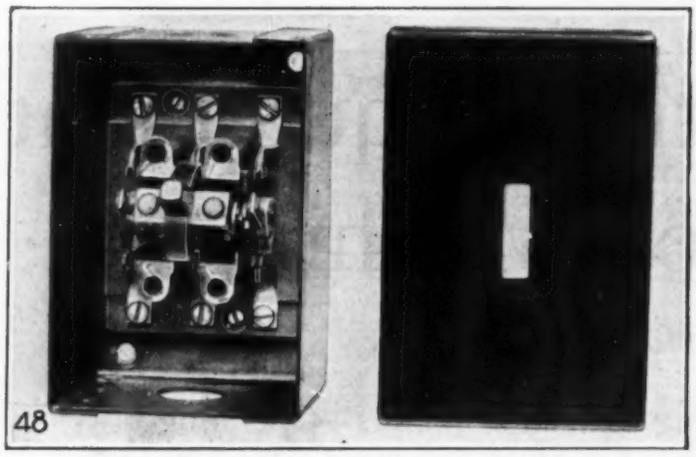


Fig. 47—Open control panel for 50-hp. slip-ring induction motor

The sixth article. The seventh will appear in an early issue.



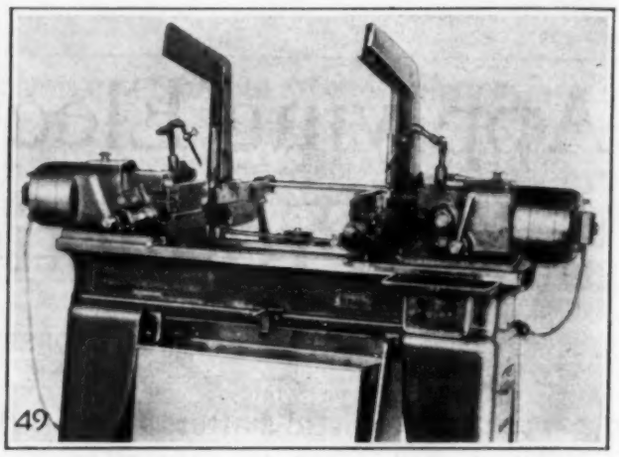


Fig. 48—Tumbler switch for use with motors up to 1 hp. Fig. 49—Application of tumbler switch for motor control on an automatic centering machine

In Fig. 49 is shown an automatic centering machine, in which three ¼-hp. motors are controlled by two small tumbler switches. These are mounted at the right hand side of the bed and are protected by a plate, which also acts as a tool shelf. In this machine there is a cavity in the right hand leg casting in which fuse blocks for protecting the motors are mounted. The word "fuses" is cast on the plate covering this recess.

When a switch is used for motor starting, the motor should be protected by fuses. Switches may be obtained that provide a fuse block in the body of the switch, while fittings are made that consist of a small box with hinged cover for containing the fuse block, with a place for mounting the snap switch on the outside. Both these devices are good and make compact, and inexpensive starting devices for small motors. A fused knife switch can also be used for starting small motors, which may be thrown directly on the line. If such a switch be used, it should be what is known as a safety switch; that is, it should be completely inclosed and should be operated from a handle outside the switch cabinet. Such a switch is usually not as small and consequently, not as well adapted for mounting on a machine as the special snap switch. The ordinary snap switch sold for use on lighting circuits, should not be used with motors larger than ¼ horsepower, as the contacts will be quickly destroyed by arcing.

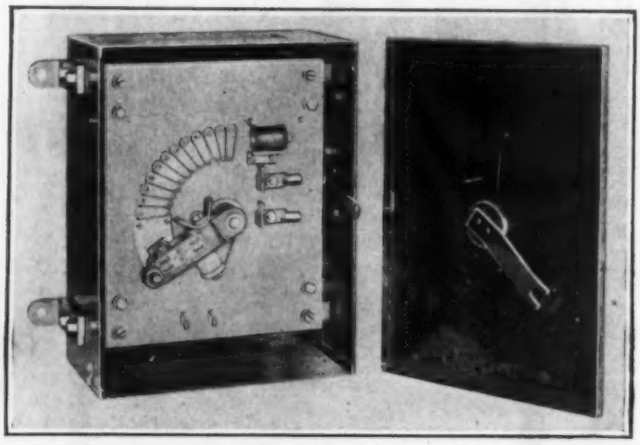
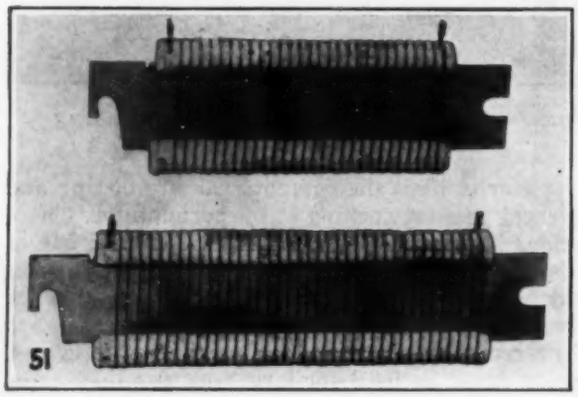


Fig. 50—Dial-type controller for d.c. motors

Probably the dial type of starter is used more frequently than any other. It consists of a faceplate bearing a number of contact points, usually mounted in an arc of a circle with an arm bearing a contact adapted to ride over the contacts of the faceplate. There is a resistor of some sort, usually mounted back of the faceplate, with connections running to the contacts. These connections are so arranged that, as the arm is moved from the starting position to the first running contact, the motor is started with all resistance in series with the armature. The arm is then moved slowly to the running position, thus cutting out the resistance step by step until the motor is finally connected direct to the line. It is highly desirable to provide a starter of this type with a protective cover, to protect the contacts from dirt and the operator from touching the energized contacts.

This dial type of starter or regulator is made in three forms. The first is so arranged that the arm may be



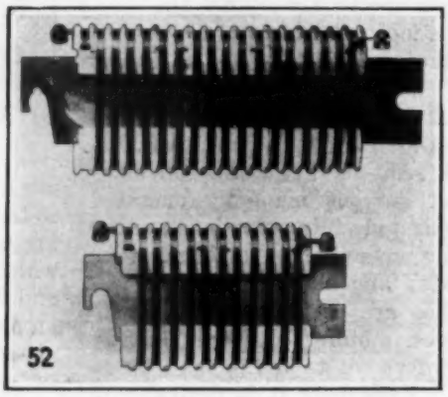


Fig. 51—Wire-wound resistance bobbins. Fig. 52—Ribbon-wound resistance units. Fig. 53—Cast resistance grids

left on any point. This is a speed regulator and is designed to make it possible to run the motor with resistance in series with the armature, thus giving a reduced running speed. This method of control is seldom used on machine tools, because the speed so obtained varies with the load, and it is wasteful of power because of the loss in the resistor. Such a starter should not be used for varying the speed unless the resistor is designed for this service. For most machine tool applications, good regulation is desirable, and consequently a control that allows large speed variation with variation of load is undesirable.

The second type is shown in Fig. 50. It is so arranged that it is impossible to leave the controller with part of its resistance in circuit. If the hand be removed from the starting handle before the resistance is completely cut out, a spring forces the handle back to the "Off" position and disconnects the motor from the line. A small magnet coil, shown at the upper right hand side of the panel, either in series with the shunt field of the motor or shunted across the line, holds the arm in the running position once it has been brought there. A failure of voltage, or a failure of the shunt field, should the holding coil be in the field circuit, will release the arm and so automatically disconnect the motor. The circuit to this holding coil, when it is of the shunt type, may be interrupted by a "stop" push button placed in any convenient position, and so make it possible to stop the motor from a location some distance from the controller. Such a push button or an equivalent specially designed limit switch may be used to stop a motor automatically should some moving part of the driven mechanism be in danger of striking some other part of the mechanism. A controller of this sort is commonly used with constant-speed, non-reversing motors that must be infrequently started and stopped.

The cover, with its operating lever, is shown removed in order to show the mechanism. The resistors, which are mounted back of the panel, may consist of wire-wound bobbins as shown in Fig. 51, ribbon wound as shown in Fig. 52, or resistance grids, as shown in Fig. 53. The resistance wire or ribbon is usually made of a compound such as Nichrome, which does not change in resistance or oxidize with heat. The grids, on the other hand, are usually cast from a special silicon iron. Any

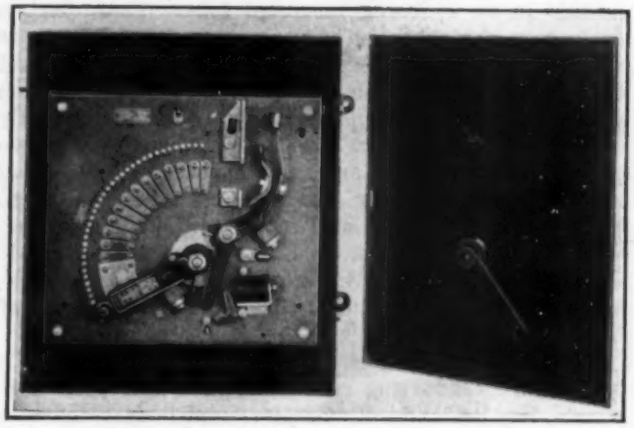


Fig. 54—Dial-type starter for use with adjustable speed d.c. motors

of these units may be mounted in banks to obtain the requisite capacity.

The third dial type of starter shown in Fig. 54, is for use with adjustable-speed d.c. motors. During the starting period, the motor is operated at full field, and the starter acts precisely as does one of the second type. However, after the starting resistor has been completely cut out by moving the arm to the extreme right, a switch, shown at the right of the starter, operated by the arm, and held in position by a small shunt magnet, which may be seen to the lower left hand of the panel, short-circuits the armature resistance. It is then possible to cut resistance into the field circuit of the motor by moving the arm back toward the left over the outer arc of small buttons. This arm may now be left on any of these buttons, thus allowing the motor to run at any speed for which the rheostat is designed by leaving the arm on the proper contact. This type type of starter is satisfactory for installations in which the motor is started and stopped, or its speed adjusted infrequently, certainly not more often than once per hour.

There are two other sorts of starting switch that start a motor with a certain amount of resistance in series and then cut it out gradually. The first type consists of a resistor made up of a pile of carbon disks,

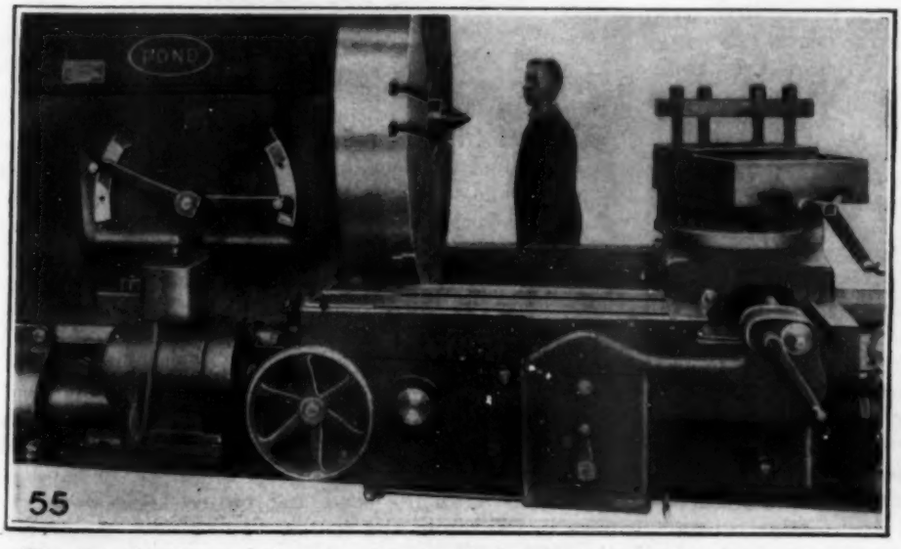


Fig. 55—Small reversing-type drum switch on lathe carriage traverse motor.

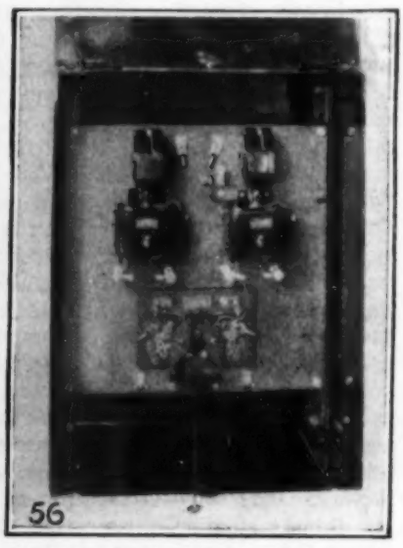


Fig. 56—Protective contact panel for use with drum controller

usually in an inclosing insulated tube. These carbon disks have the property of decreasing in resistance as the pressure is increased. The pile of disks is first connected in series with the motor armature, and then pressure is gradually applied. When the motor is nearly up to speed, the carbon pile is short-circuited by two copper contacts which are held in position by a small holding magnet, either directly or through a latch. This type of starter is still in use, although manufactured in the United States by only one company. It gives a very smooth, even acceleration and is particularly advantageous where this characteristic is of importance.

The second type uses a tank filled with water to which some conducting substance, such as sodium carbonate, has been added. One terminal is fastened to a fixed electrode, usually in the bottom of the tank. The other terminal is fastened to an electrode whose distance from the fixed electrode may be varied. The tank of solution is the resistor, and the resistance in circuit may be slowly cut out by gradually bringing the electrodes together. This type of starter is seldom, if ever, used in this country at present, although still common in England.

Use of Drum Controllers

Drum controllers, either of the reversing or non-reversing type, are made to throw a motor directly on the line; to start constant-speed motors with a resistor in the armature circuit and then to short-circuit it gradually in order to bring the motor to speed; to vary motor speeds by starting up the motor and leaving it on a running position of the drum with a certain amount of resistance in series; and to start an adjustable-speed motor by introducing in the armature circuit a resistor that is gradually short-circuited with the motor operating at full field strength. In the last case, after the starting resistor has been cut out, resistance is cut into the shunt field circuit. The drum may be left at any position, thus allowing the motor to run at any desired speed within the range provided for by the field rheostat, up to the full speed of the motor.

Controlling Small Motors

The simplest type of drum is that used as a simple starting or reversing switch. This is generally used only to control small motors that run but a small portion of the time under close supervision of the operator. The majority of the motors, for which a switch of this sort is applicable, are used for some form of traverse or clamping service such as the elevation of a planer crossrail; the rapid traverse of the tool heads of a planer; the rapid traverse of a lathe carriage or tail stock; the clamping of a planer crossrail to the housings; the clamping of a radial drill column to the base; or similar applications. A switch of this sort, which connects the motor directly to the line, should be used only with small series-wound constant-speed motors or with those having a high percentage of compounding, unless a resistor, called a ballast resistor, is permanently connected in the armature circuit. For certain classes of work, particularly for machines requiring a relatively small amount of power after the member to be traversed has been started from rest, a ballast resistor is very satisfactory. It is not desirable to use across-the-line starting for d.c. motors larger than 3 hp., 5-min. rating. Above this rating some form or starting resistor is desirable.

In Fig. 55 is shown a small reversing switch mounted above the carriage traverse motor of a large lathe. This switch contains a starting resistor, which is cut out in one step as the motor comes up to speed. Fuses are also provided for overload protection of the motor. The handle of the switch is arranged so that it throws back to the neutral position and shuts off the motor as soon as the operator's hand is removed from it. A switch of this sort is very desirable for this type of service, as it contains within the one piece of apparatus everything necessary for the control of the motor.

High-torque motors used for clamping, as on the crossrail of a planer or boring mill, the column of a radial drill, the tailstock of a lathe or on similar service, may also be controlled by a simple across-the-line type of switch.

Overload Protection

It must be remembered that such a switch provides neither overload nor no-voltage protection. Overload protection may be obtained by the use of fuses, an overload circuit breaker, or by an auxiliary protective contactor panel with a thermal or other form of overload relay, such as is shown in Fig. 56. This panel is made up of two contactors, which serve to connect the line to the controller, and a thermal overload relay. The connections are such that the contactors are closed either by by a contact in the drum at its "off" position, or by a "reset" push-button station. As soon as the contactors are closed, they remain in that position until they trip out because of overload or undervoltage. They cannot be restored until the overload relay is restored and the drum is returned to the "off" position.

Circuit breakers and protective panels are seldom used with switches of this type as fuses give sufficient protection to most small motors. Low-voltage protection may be obtained only by means of a protective panel or circuit breaker of the proper type. Traverse and clamping motors in general do not require low-voltage protection, as the drum switches used generally are provided with springs to return the drum to neutral when the operator releases the handle.

Removing a Broken Center Drill —Discussion

By Wm. S. Rowel

THE device shown in an article by E. Palmquist, under the title given above, and published on page 876, Vol. 65, of the *American Machinist*, is good. However, the danger of breaking the drill could be lessened if it were made shorter. Also the time of drilling would be less, and last but not least, if the drill does break, the broken piece can readily be removed. While makers of combination drills and countersinks have learned something about the proper length of the drills, they yet have something to learn. The drill is still too long.

Many mechanics believe that large deep drill-holes in the centers of work, are necessary as oil reservoirs. The truth is that many centers are burned while oil still remains at the bottom of the drill-hole. One of the best ways to lubricate a lathe center, is to have a good supply of white lead and oil trickling down a groove in the top of the center. The groove should be both wide and deep at the large part of the center and should be tapered so as to disappear at the point.

Comparative Testing of Taps

By A. C. DANEKIND
General Electric Co.

Small tools of different makes are so similar in appearance that some practical method of testing is needed for comparison—Description of the tests made on taps

SMALL tool manufacturers have followed a common design so closely that tools of different makes are often very similar or almost identical in appearance. Only after careful inspection can slight variations in design be detected.

While two tools may appear identical to the casual observer, a great difference may exist in actual performance. The characteristics which distinguish one tool performance from another are due principally to methods of machining, hardening, and finishing. This fact can be more readily understood after an observation of the manufacturing, heat-treating, and inspection methods of the various makers.

Little information has been available concerning the comparative performance of taps of different makes. Each manufacturer eulogizes his particular brand of taps through advertising, and through his salesmen. No practical comparative information is offered the user by any maker, and as each quite naturally claims superiority for his particular tap, the problem of selecting the best tap for the job confronts both the purchasing department and the ultimate user.

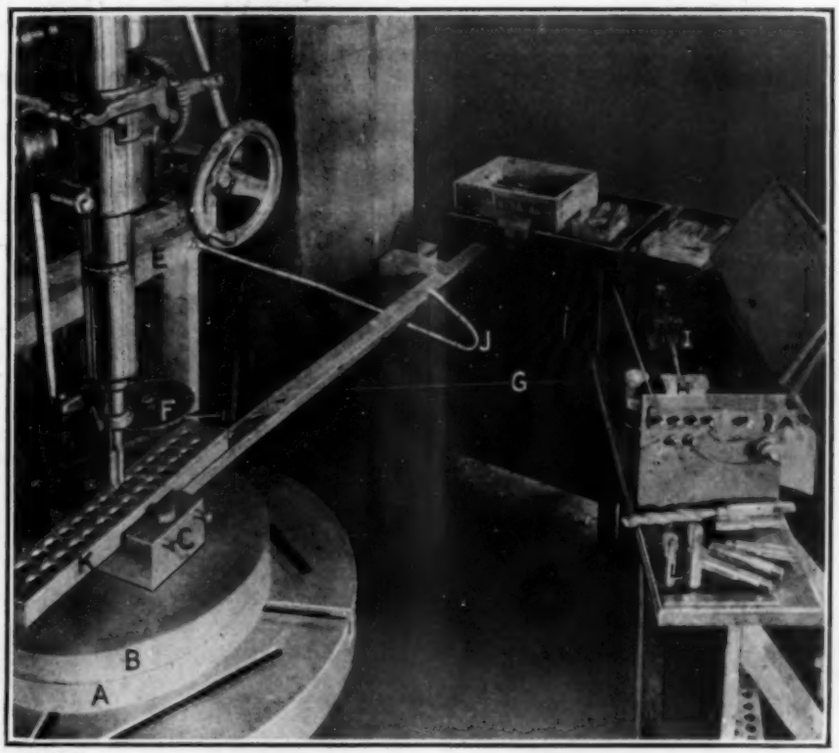


Fig. 1—Mechanism for the testing of taps

It was decided to gather data through a series of tests in order that specific recommendations could be presented. This would permit the attainment of both quality and quantity in production tapping at a minimum cost. In other words, the information gained was intended to be sufficiently complete to determine the best tap for our requirements for each dollar expended.

The principal reason for undertaking these experiments was to determine the make of tap best suited for our particular requirements. From time to time many important possibilities revealed themselves. The question of ground and unground taps arose, as well as that of high-speed versus carbon-steel taps. In order that the investigation might be as complete as possible, all of these questions were investigated, and detailed conclusions were determined from the results of the tests. The results obtained form a practical guide for production tapping.

The apparatus for testing the power efficiency and endurance of different brands of taps is shown in Fig. 1, rigged up to a drill press. Plates *A* and *B* are of machine steel about 21 in. in diameter and 2 in. thick. Grooves for ¾-in. balls are cut in each plate about 1 in. from the outer edges. Plate *A* is bolted fast to the drill press table and supports plate *B*. The balls between the two act as a ball-thrust bearing and permit the upper plate to revolve with little friction.

The test pieces, *K*, are held in a vise *C* for drilling and tapping. This vise is bolted fast to the upper plate. A projecting arm *D* transmits the torque of the tap to the scale *F*, held rigidly in place by a rod through a back support shown at *E* in the illustration.

A string *G* transmits the effect of the torque to the inking pen mechanism. As the recording chart is rotated, the actual torque of the tap is registered on the chart in foot-pounds.

With a dynamometer of such construction, the calibration and adjustment were readily made. The scale spring was of such tension that one complete revolution of the pointer signified a torque of 150 lb. The pulley mounted on this pointer held the string in place, so that one complete revolution of the pulley indicated the same torque. The recording chart was ruled off into ten equal spaces. Since the scale was attached to the projecting arm at a distance of exactly one foot from the center of the plates, the readings of the chart were direct in foot-pounds, each space signifying 15 foot-pounds. With a slight tension on the scale, the inking pen was positioned on the first line, and from this point the torque of the tap was recorded as the machine was operated.

Commercial and ground thread carbon steel taps were used in the tests. This was done to get a direct comparison between the merits of ground and unground thread taps, assuming the steel and heat-treatment as being identical for both types. A test was later conducted with high-speed steel taps. This test was made to determine the relative merits of carbon and high speed taps. The 1-in. size was chosen first because of the small risk of breakage. It was also felt that this size was representative, and that data obtained would form the basis for reliable deductions regarding tap performances in general. Complete tests were later conducted with ⅝-in. and ⅜-in. taps and with others smaller in size.

Taps of six prominent makers were purchased and inspected for accuracy. Both pitch diameter and lead readings were taken from each tap. The maker's name was then ground from the tap and an identifying symbol substituted. It was at first thought that six taps, three ground and three commercial, of each make and size would be sufficient to conduct the tests, but additional taps were later secured when there was a question of doubt in any individual performance. More than one tap was tested in order that an average performance could be taken, rather than that of a single tap. In Fig. 2 it is seen that considerable difference exists between the commercial taps made by the various manufacturers.

The test blocks were of ordinary grey iron and machine steel. The blocks were machined on the top and bottom to remove scale and afford metal of more uniform structure. These blocks were all 1½ in. thick, and

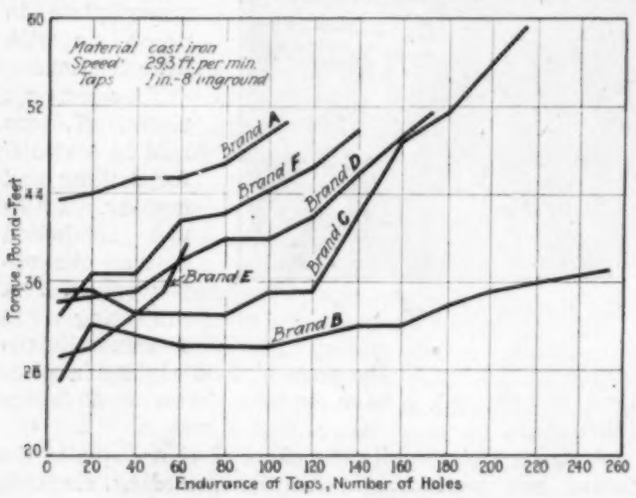


Fig. 2—Chart showing torque exerted and relative endurance of taps of six different makes

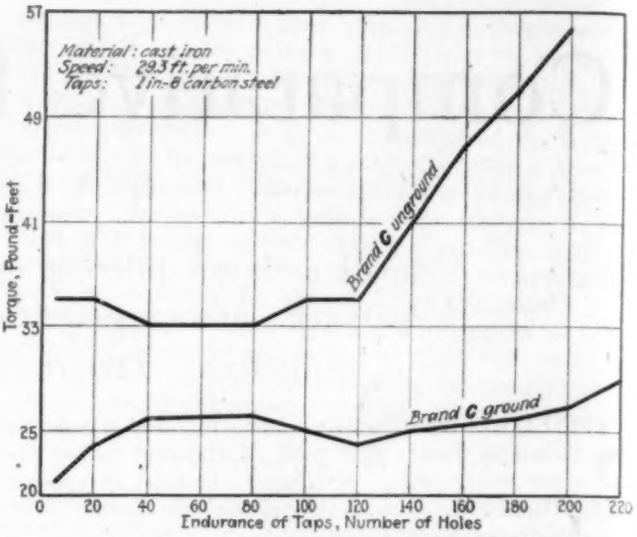


Fig. 3—Comparison of the torque exerted and endurance of ground and unground taps of the same make

approximately 2 ft. long. They were of such width that two rows of holes could be drilled and tapped with very little waste in metal. At *K* in Fig. 1, one of the blocks is shown. The drilling and tapping on the 1-in. tests was done on a 36-in. upright drill press. A lighter upright drill press was used for the smaller sizes.

The apparatus described proved very satisfactory. Much data was gathered from which power efficiency and endurance efficiency curves were developed for various brands and types of taps. The apparatus used for handling the chart and inking pen mechanism gave permanent records on charts. Very minute details in the operation of tapping reveal themselves on these charts.

There exists a direct relation between the torque exerted and the endurance to be expected from a tap. For this reason a study of charts for consecutive holes is a very interesting one. As a tap becomes dull the torque exerted gradually increases until the point is reached where the tap "goes to pieces," figuratively speaking, and the torque exerted shows a line nearly vertical in direction.

The length of a chamfer on a plug tap is a very important factor, greatly affecting its endurance. A tap chamfered for the length of four threads will exert a torque about 30 per cent greater than one chamfered the length of six threads. In the general comparison of records of ground and unground thread taps much difference is seen to exist between the cutting action of the two taps. This is clearly shown in Fig. 3 by the rapid decrease in efficiency of the unground tap after the completion of 120 holes.

The Small Shop Sales

By R. Senay

EVERYTHING can be made that can be sold, though not everything made can be sold profitably. Nowadays, distribution is more important than production, so by means of a bulletin we tell our employees: "Our sales control our production and our profits; no sales, no production; enormous sales, enormous production. Find a customer for us, and you will find an extra check in your pay envelope."

It seems radical, but it works.

Automotive Production

Lycoming Connecting-Rod Flywheel and Piston Methods

THE method of securing locating points for machining the connecting rods of the motors built by the Lycoming Manufacturing Co., Williamsport, Pa., is rather unusual. As a preliminary operation, the rods are brought to standard length and ends of both hubs, or bearings, are flattened by being "coined" in a 600-ton Toledo press. Then the locating points are milled at the center of the bolt bosses on each rod, from which point the rods are located for succeeding operations. Before babbitting the large ends, the holes are elongated so as to allow for the thickness of the saw used in cutting off the caps. By this method, there will be no necessity for the use of shims between the caps and the rods in assembling the motors, as would be the case if the holes were not elongated.

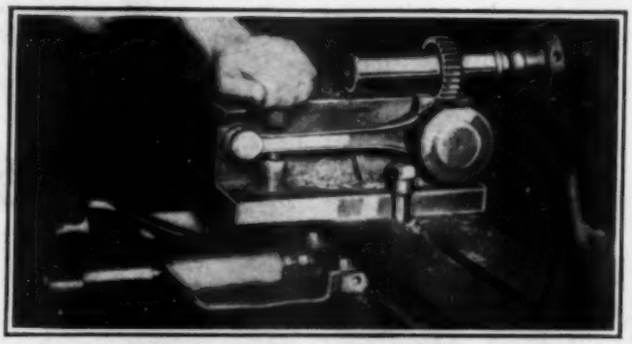


Fig. 1—Milling locating point on side of bolt boss

The babbitt lining is cast by the centrifugal method. Final boring of the rods is not done until after they have been delivered to the assembling department. A fly cutter is used for this operation. It takes a very light cut, and an air blast is provided to blow away the chips as fast as they are made. This method of final finish for the rod is indicative of the great care being taken by builders of good engines to secure the longest life possible on the connecting rod bearings. It is also a vindication of the well-known belief that a fly cutter makes a hole as nearly round as any method we have yet tried out.

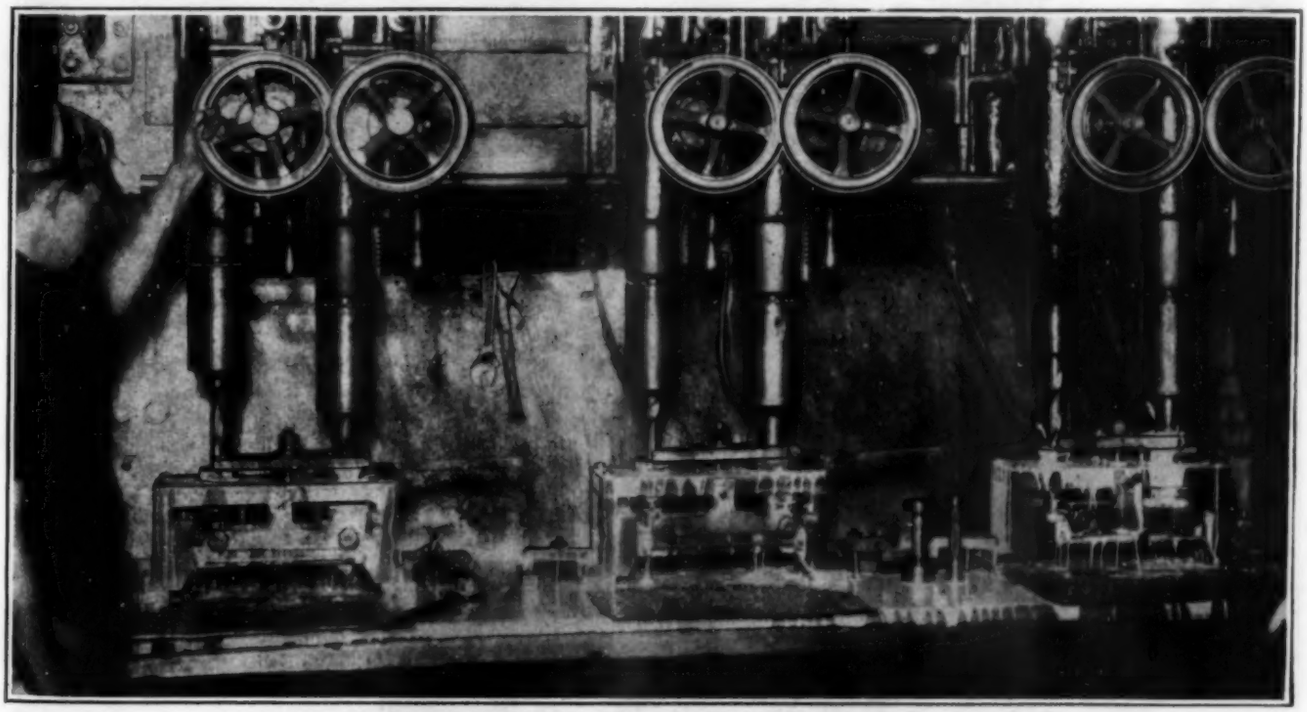


Fig. 2—Drilling both holes at once with three pairs of spindles

Automotive Production

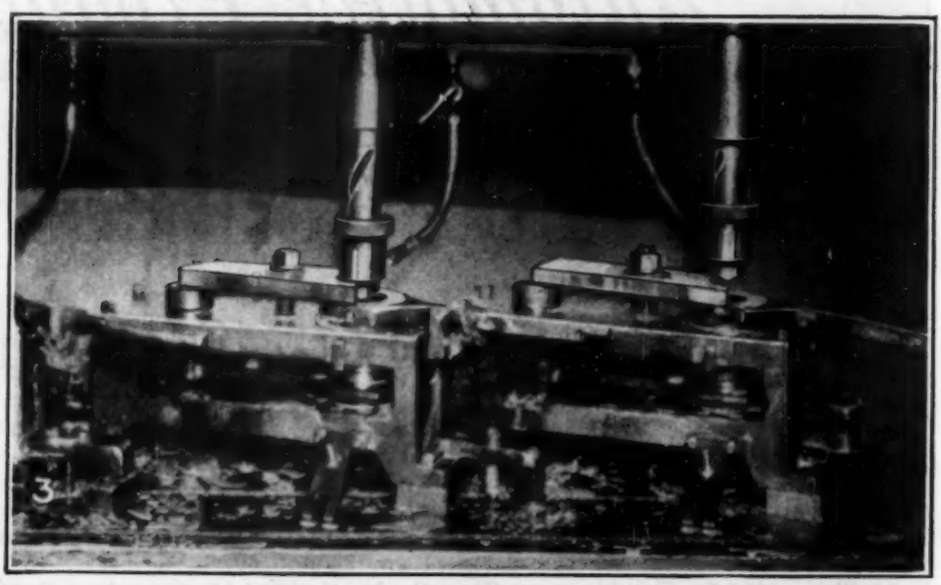
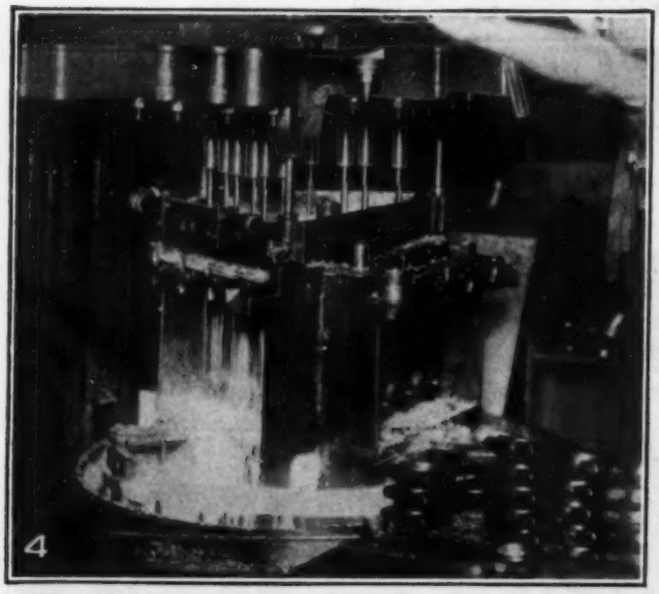
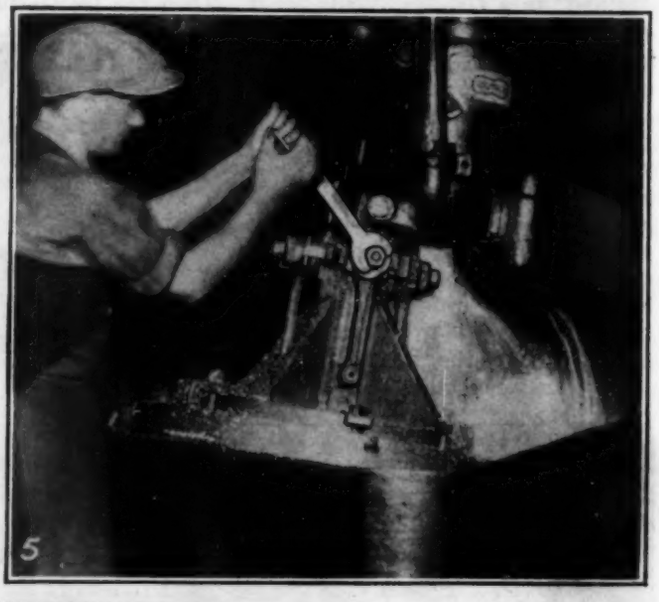


Fig. 3 — Elongating the large hole to allow for the saw cut. The cutter removes metal from one side of the hole only

Fig. 4—Three-sided fixture for drilling bolt holes. At one side the rods are drilled, at another they are reamed, and at the last is the loading position





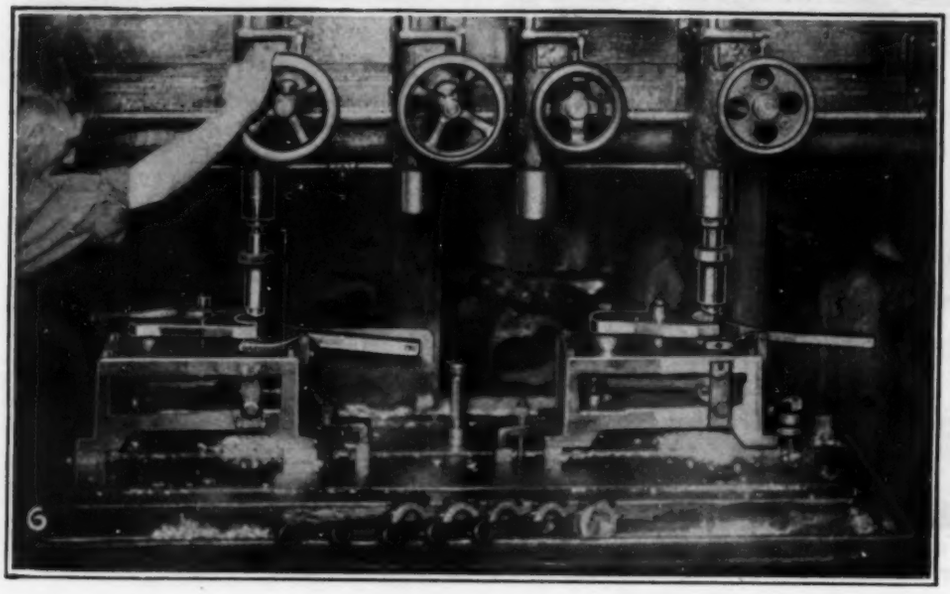


Fig. 5 — Milling bolt bosses on the Ohio tilted table machine. The work is flooded with lubricant

Fig. 6 — Finish boring the large holes with fly cutters in Foote-Burt machine

Automotive Production

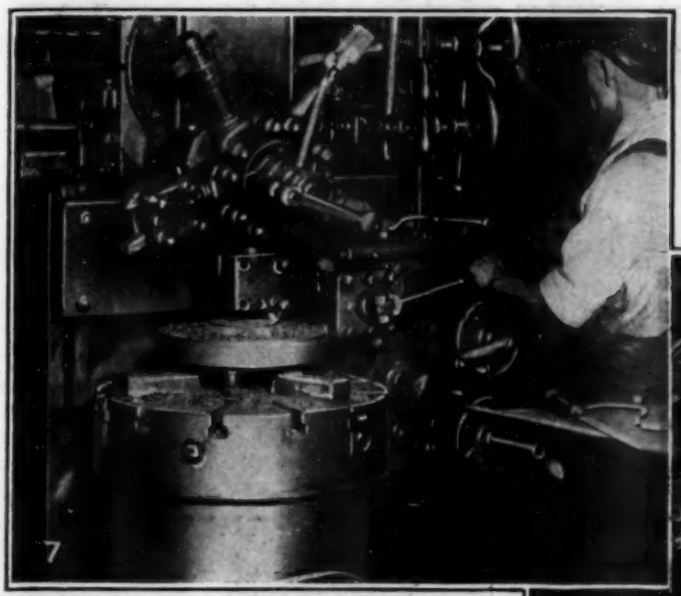


Fig. 7—Taking first cut on flywheel. Holding by chuck jaws inside of rim

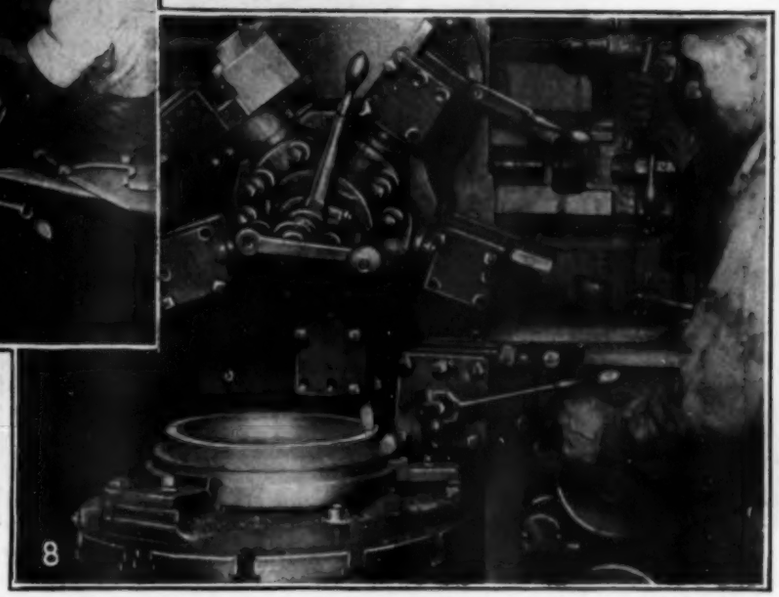


Fig. 8—Second operation. Wheel turned over and held by clamps. Both operations on Bullard vertical turret lathe

Fig. 9—Testing accuracy of flywheel. Three dial gages on fixture to test various surfaces. The tolerance is 0.003 in.

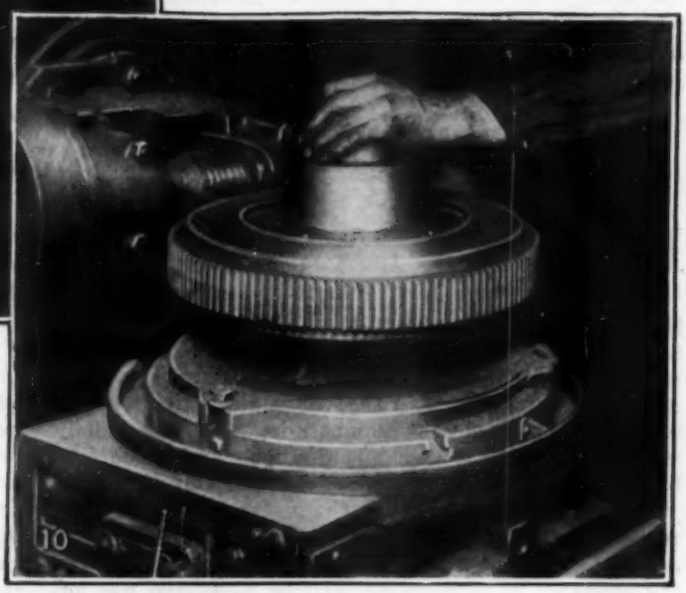
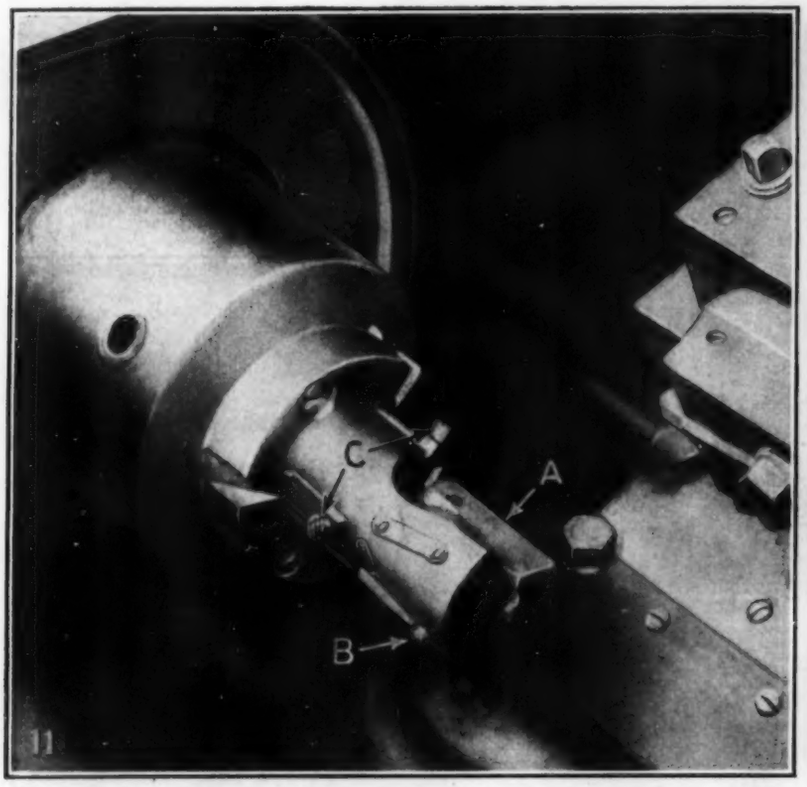


Fig. 10—Hobbing starter gear teeth on two wheels at once. Gould & Eberhardt machine

Automotive Production



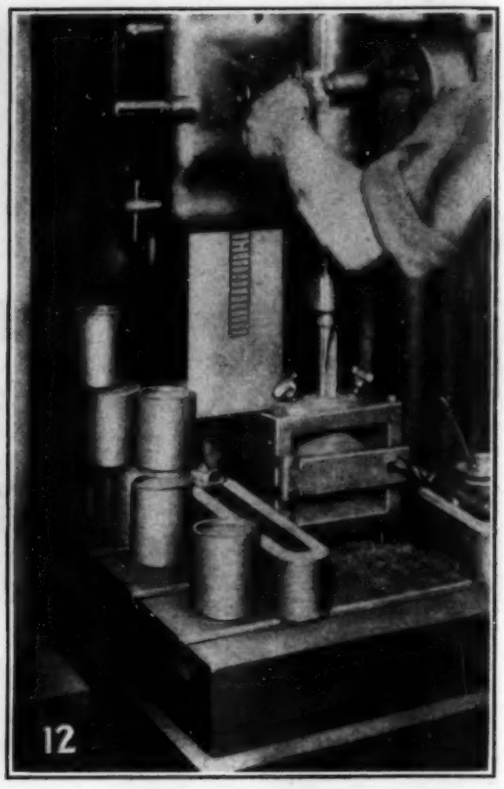


Fig. 11—Mandrel for turning pistons. Fig. 12—Fixture for boring piston-pin hole

Pistons are handled somewhat differently than in most shops so far as the first operations are concerned. Instead of boring and facing the open end of the skirt for a locating point, the pistons are first turned and faced on the end, future operations being located from these points.

The pistons are held on the mandrel shown in Fig. 11 in which a part of the body is cut away at *A* to accommodate the piston pin bosses. The piston is slipped on the mandrel until the end of the mandrel contacts with the head, thus securing a uniform thickness of head when faced off. The piston is held by two sets of internal, expanding jaws, some of them being shown in *B* and *C*.

After the pistons are rough turned to a given diameter, and faced, they are chucked and the open ends of the skirts are bored and faced. They are then cross bored for the piston pin in a box jig as in Fig. 12, being located at the end by the head and by the outer diameter.

Further operations consist of finish turning, grooving, grinding and relieving, after which the holes are finish bored and reamed to insure both size and squareness with the sides and heads. The final turning operations are done with the piston held on a draw-bar chuck by means of a loose pin through the piston-pin hole. The other operations are similar to usual practice in production shops and special reference is unnecessary.

The Proper Use of Wrenches—Discussion

BY A. M. MORRIS

IF I MIGHT add to R. H. Kasper's comments on page 1067, Vol. 65, of the *American Machinist* regarding the unnecessary straining of nuts and screws, I would say that it has been my observation throughout the shop generally, that the excessive tightening of threaded parts is done with the idea of preventing the parts from jarring loose rather than that the tightening is necessary to hold the machine members together. Especially is this true in the case of machine tools and production fixtures, where there is frequently much vibration.

In most cases of this kind, the screw or nut might be prevented from loosening by the use of a lock washer accompanied by the application of a moderate pull of the wrench. It is certainly neither necessary nor advisable to overstress a screw solely for the purpose of building up frictional resistance with which to combat its tendency to jar loose.

On fixtures where dowels cannot be used, and where it is necessary to clear the capscrews in order to allow for adjustments made necessary by variations in the parts to be machined, it is a much better plan to use lock washers on the screws than to omit them and then find, after a few adjustments, that the threads are stripped, the screws broken, or all the corners of the screw heads rounded. A lockwasher, when being compressed under a nut or capscrew, gives a visible indication of the applied load. When the washer is cinched, that in itself is the signal to remove the wrench.

Machinery Exports in 1926

Industrial machinery exports show steady increase—Greatest gains in mining and construction machinery—Metal-working and textile machines meet greatest competition

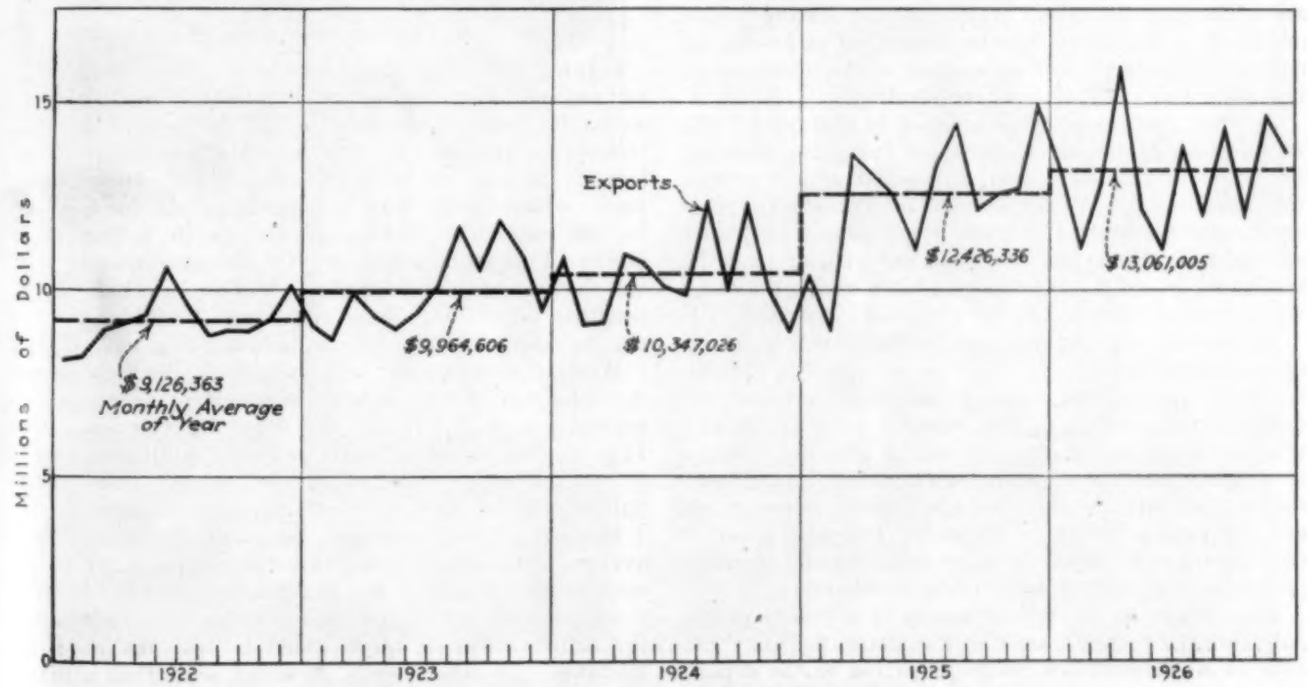
INDUSTRIAL machinery exports from the United States during the year 1926 exceeded those of any year since 1921, and were greater than any previous year with the exception of those of the abnormal war period. The total of $156,732,000 worth of industrial machinery exported in 1926 represented an increase of 5 per cent over the previous year. Exports of industrial machinery have been growing steadily since the year 1922, and prospects for the immediate future are bright in spite of the slight drop that occurred towards the end of the year according to figures furnished by the Department of Commerce.

The accompanying chart shows the growth in machinery exports since the depression after the post-war boom. It also shows the steady increase in the monthly export average. Not all machinery manufacturers have experienced this increase of exports of their product, however, and figures indicate that metal-working machines showed a decline in exports of 14 per cent as compared with the 1925 total, while the increases were made up of larger exports of mining, oil-well, and pumping machinery, and construction equipment. The totals of textile, sewing, and shoe machinery exported also showed declines. While no figures from other sources except German are available, it is considered that these declines are due to increased purchases from Europe by the buying countries rather than any decrease in actual buying activity. German export figures for 1926 show large increases in the exportation of machine tools and manufacturing machines.

That the export of American metal-working machinery has made a net gain, however, is shown by the fact that the value of the 1926 trade in this class of machinery represented double the average of the five pre-war years, although in making this comparison the increase in machinery prices since 1913 has not been considered. The total exports of metal-working machinery during 1926 amounted to $18,968,140.

Exports of internal combustion engines during the year totaled $5,954,340, a gain of 41 per cent over the exports of the year 1925, and nearly 2½ times the exports of the year 1924. American engines are shipped to almost every country in the world, but find their chief markets in Canada, Australia, China, Japan, and South America. Shipments of steam engines and turbines during 1926 showed a decline, but no definite trade trend can be assumed for this since sales of these machines are largely dependent upon power developments.

Shipments of American textile machinery showed a marked decrease, which is attributable to increased competition from European firms. The exports of this class of machinery for the year amounted to $10,400,270, as compared with $11,488,800 for 1925, and $12,268,300 for the year 1924. The textile machinery exports for the pre-war year 1913, however, amounted to only $1,962,380. China, Japan and Canada have been the largest



Monthly exports of American industrial machinery

markets in the past for textile mill machinery. Knitting machinery is now the most important class of textile machinery exported, but in this field the total exports declined slightly from last year.

Exports of mining and quarrying machinery have been steadily gaining, and the total of $14,857,000 for the year represented a gain of nearly 41 per cent over 1925. Shipments of coal cutters totaled $634,550, or more than treble those of 1925. Exports of ore crushing and sorting machinery amounted to $4,048,270, and represented nearly double the exports of this class of equipment in 1925. In concentrating and smelting machinery exports totaled $1,163,960 or more than double those of 1925. Oil-well equipment exports totaled $15,303,060 in 1926, and represented a gain of more than 60 per cent over the previous year's total.

Shipments of power pumps, amounting to $5,271,261, made a gain of 9 per cent over those of 1925, despite slight decreases in exports of both centrifugal and steam pumps. Exports of unclassified power pumps were as follows: steam pumps, $1,492,300; and $742,050 worth of centrifugal pumps.

In construction and conveying equipment, shipments amounted to $17,047,000, and were one-third more than in 1925. This machinery group has shown a steady growth in exports since 1922, when they totaled only $7,295,480. Shipments of construction machinery in 1926 amounted to $9,030,150, an increase of a third over the exports of 1925 and approximately treble the 1922 shipments.

New Trademark Regulations

THE proposed new Federal trademark law, as analyzed by the Mida's Trade Mark and Patent Bureau, Chicago, contains some outstanding features of interest to business in general. The new statute will incorporate radical changes, including tripled registration fees, time limitations in establishing abandonment, territorial divisions, and the installation of enlarged search facilities by a system of depositing trademarks and names.

The clause pertaining to abandonment fixes a period of two years, and any mark that has not been used for that period may be adjudged abandoned. In consequence, the difficulty of procuring conclusive evidence of abandonment of a trade mark would be simplified.

Much latitude would be given to registration of marks under a provision that exclusive use of a mark for five years preceding application shall not be rejected merely because the nature of the mark is descriptive, consists only of a personal name not distinctively displayed, or of geographical derivation. Marks of the nature stated are within the inhibition of the present statute. Such marks after five years shall be considered as having acquired a secondary meaning instead of the literal meaning, and to be susceptible to registration.

Another feature of wide interest is that permitting registration of the same mark for the same goods by two or more claimants upon agreement of the parties, thus allowing the Commissioner of Patents to grant certificates for limited sections in accordance with such agreements. Numerous marks in use without trade interference would thus find an equitable channel through which to hold registration for a limited territory.

Instead of confining registration to marks used only on merchandise the scope would be increased to embrace marks of service and names of business concerns, organizations, societies, unions, whether used merely as a trade name or in conjunction with a trademark device to identify such business or organization. Obviously, names that identify the source of goods, although not actually used in branding the goods, represent goodwill that should be accorded the same protective measures as prescribed for symbols identifying merchandise.

The system of depositing marks is a provision empowering the Commissioner of Patents to maintain records of all common-law claims imparted to the department without being subject to search of the registration records. The idea is to provide a means whereby trademarks, trade names and other insignia that identify either merchandise or business may be entered or deposited for ready reference of those who wish to search such claims.

This deposit system would not be tantamount to registration, or serve any function of registration, and in order to encourage depositing for the purpose stated the law would place a premium upon prompt deposit requiring that it be made within a year after the law went into effect or, thereafter, within a year after adoption of such marks, symbol or name. In failure to make the deposit within the time stated anyone wishing to apply later for a registration would have to pay triple the government fee instead of the usual fee to those who comply with this requirement or who apply, without preliminary deposit, directly for registration.

Standards for Gage and Key Sizes

BY K. E. SUMMERS

Coining a very apt phrase of the *American Machinist*, can anyone "just suppose" what a boon to mechanics it would be, were it possible to call for a drill by the number of thousandths it represents instead of by a number bearing no relation whatsoever. How much easier when a 0.098 drill is required to call for a number 98 instead of making a wild search to find that number 40 must be asked for. Of course, somebody will say that we have number drills that go into half thousandths, as 0.0995. Very true, but it still seems to me far more convenient to say number 99½ drill.

While still dreaming, let's go still further and wonder why call Woodruff keys and cutters anything so euphonious as No. 1, or A. Why not 1 in. x ¼, or 1½x⅜ in., the same as when ordering milling cutters? It takes a little longer to say 1x¼ in. Woodruff than number 15, but it leaves no doubt as to the size.

Similarly, this is true with sheet and wire sizes. The average sheet metal worker has little conception of thousandths, and a gage or two difference doesn't mean very much to him, yet if the gage number coincided with the actual thickness there would be less likelihood of mistakes. In other words, it would seem that a little simplification and standardization would work wonders.

A Glimpse

In a Modern File Shop

No mystery in file making—Blanks forged on standard machines—Filemaker's nomenclature misleading—Shaping blanks in roller dies—Preparation for cutting teeth

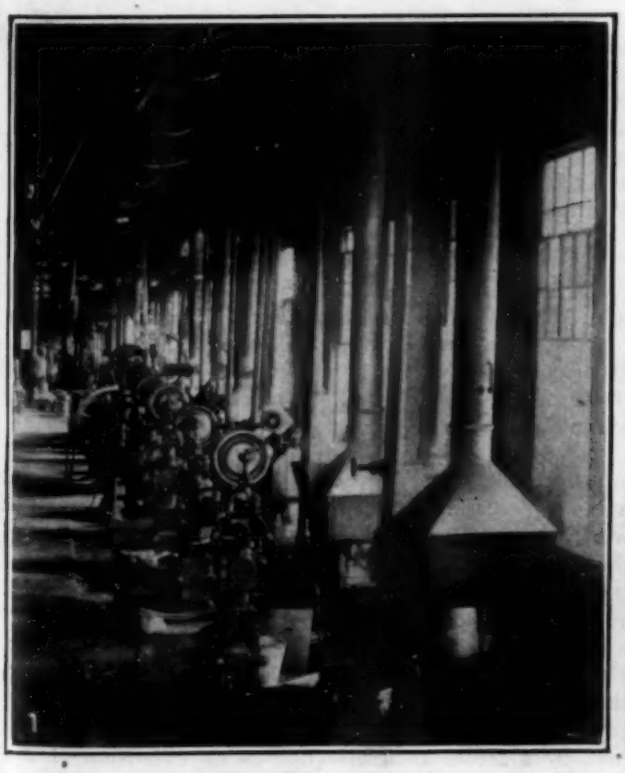
IN THE file shop of the Simonds Saw & Steel Co., Fitchburg, Mass., there is no mystery. Modern machinery and scientific processes conducted with mathematical exactness displace the half-superstitious and even less understood rites which the old-time filemaker practiced in secrecy, and in fear that some rank outsider would discover that he did not really know that which he pretended.

The forge-shop is equipped with modern oil-fired furnaces, spring hammers, power drops, trimming presses, rolls and other machinery to shape the file blanks, and with large annealing furnaces in which the heats are closely regulated by means of pyrometers. Fig. 1 is a view along one side of the forge shop, showing a part of this machinery.

Steel is received from the mills already rolled to the sections and sizes of the files to be made from it. Forging operations are confined mostly to shaping the tangs and to pointing such files as are not of uniform section from end to end, as rounds, squares, tapers, flats and others. Many files of rectangular section that have a rounded taper toward the tip, both widthwise and flatwise, are forged in dies carried on rolls similar to those of a rolling mill.

Tangs on small files are forged under the spring hammers to be seen in Fig. 1, both by hand and by means of a semi-automatic device that rotates the blank in the dies. To make the tangs of larger files of rectangular section, the end of the cut stock is struck under a heavy drop to reduce it to a wedge shape, and the tang is then cut out by trimming in a press.

While the tangs of most of the small files are drawn out under the hammer by experienced hammermen who manipulate the blanks in tongs, the semi-automatic attachment shown in Fig. 2 is employed upon some of the smaller rounds and tapers. This device consists of a rotating spindle mounted in bearings upon a slide that passes before the dies of the hammer and is driven by a power-transmission chain from an overhead shaft geared to the main shaft of the hammer. The operator sets the hot blank into the chuck of the device and pushes the slide past the dies while the hammer is run-



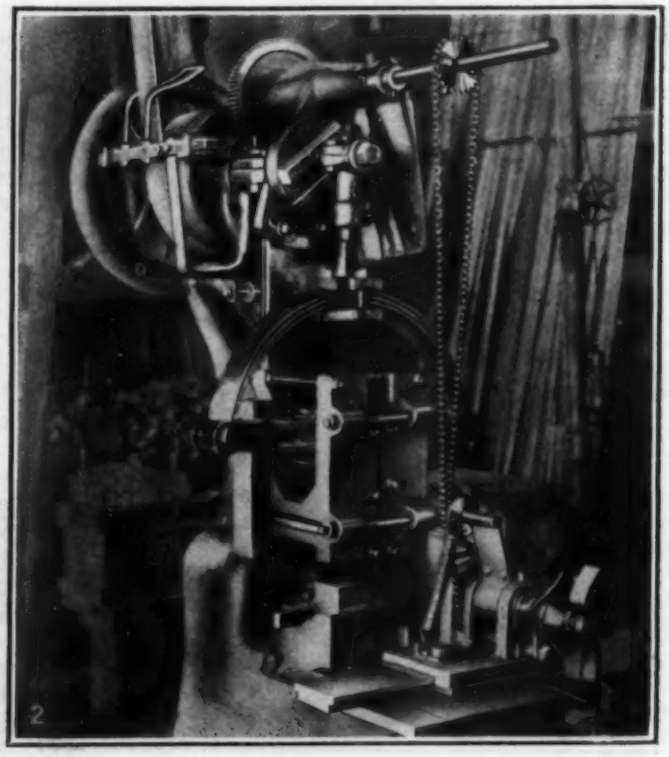


Fig. 1—A view in the forge shop. Fig. 2—Automatic device to forge tangs

Fig. 3—Dies to trim tangs of larger files.

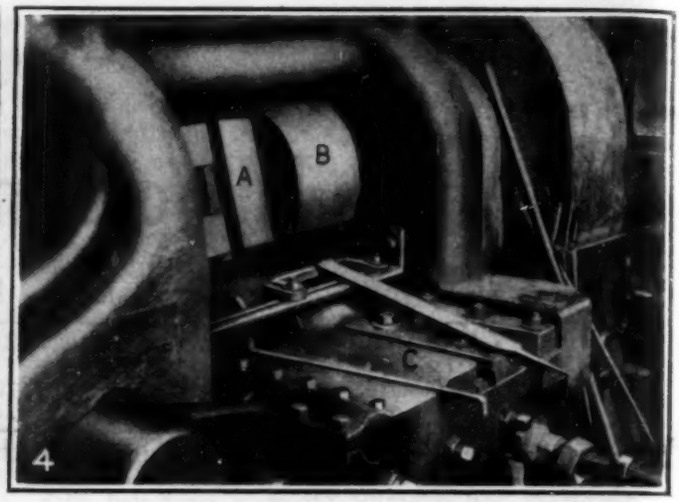


Fig. 4—The rolls to shape the flat files

ning. To make the tangs of the larger files that are rectangular in section, a piece of stock is first struck flatwise in the dies of a power drop to thin it out toward the end. The wedge-shaped end thus produced is then trimmed by the press tools shown in Fig. 3 to remove the surplus material and leave the tang fully formed. The blank is at forging heat for both operations.

The nomenclature of the filemaking trade is peculiar, and in some cases misleading. As every one knows who handles files, a "flat" file is not flat—it has a rounded taper, both widthwise and flatwise, toward the tip. This is equally true of several other shapes, the names of which are far from descriptive.

Speed in Production

To produce quickly and with uniformity this double tapered shape, the method illustrated by Fig. 4 is employed. The machine, which is but partly set up as here shown, consists of a pair of rolls geared together as in a rolling mill. A part of the surface of each roll is cut away as at *A* to take interchangeable dies, one of which may be seen at *B* in place. A further feature of this machine is a small squeezer, or bulldozer, to be seen at *C*, driven by gearing from one of the rolls.

The rolls rotate in a direction to cause a piece gripped between them to move toward the operating position. Since the radius of the dies is greater than that of the rolls, and the face of each die, measured circumferentially, is less than half the circumference of the circle described by it, there will be plenty of space between the rolls at the time when both dies are moving away from the operator; one above the upper and one below the under roll.

Into this space the operator thrusts a heated file blank, and when the dies come around to meet it, the blank is immediately ejected from the rolls toward the operator. The faces of the dies are not of constant radius, and the shape produced by the rolling operation is the rounded taper peculiar to a flat file.

Rolling the hot blank flatwise naturally causes it to spread widthwise, and to correct this condition the blank is immediately dropped between the jaws of the squeezer, which produce the desired shape widthwise of the blank. Both movements must be repeated a number of times before the blank reaches its final shape.

There is an adjustable gage behind the rolls against which the blank is abutted to begin the final pass, but this gage cannot be used in the earlier stages. The operator must know just how much reduction the stock will stand at one pass, drawing it first flatwise and then widthwise, alternately.

Fig. 5—Grinding round file blanks

Pre-determined Heat-Treatment

All file blanks are thoroughly annealed, being packed into iron pots and stacked in the furnace, where they remain for a predetermined time at a heat shown by experience to give the best results. The heat is at all times under observation and control by means of pyrometers.

Before cutting the teeth, the blanks must be ground on all surfaces to remove every trace of scale. Semi-automatic grinding machines handle this part of the work on all sections except rounds, for which section there is no machine in successful operation, though there is one under development. Round files are ground by hand, as shown in Fig. 5, on open sandstone wheels. The grinder sits astride a "horse" before the stone, which revolves away from him. The tang of the file blank is inserted in a special handle which the operator grasps in his left hand, while the tip is held by a metal hook attached to an extension of the seat upon which the grinder rests his weight. He is

thus enabled to hold the file blank in contact with the stone and let it spin, slowly or swiftly as he chooses, by regulating his grip upon the handle. This job requires skill that is born only of experience.

The second man seen in Fig. 5 is "hacking" a stone with a tool resembling an adze, with which he makes a series of rough and irregular notches across the face of the stone at an angle of 10 or 15 deg., which notches are supposed to improve the cutting quality of the stone. The stone is, of course, stationary at this time and the operator turns it forward with his foot as the hacking proceeds slowly around the circumference.

The file blanks of other sections than round are ground by automatic machines, a small part of one of which may be seen in Figs. 6 and 7. Each machine swings a sandstone wheel that is six feet in diameter when new, and about one foot thick. The machines are driven independently by 60-hp. electric motors, and so great is the power absorbed that the motors are taxed to their capacity at times. The stone is entirely enclosed in a box-like housing and cannot be seen from any point of view except at the grinding position, and there only when the work-carrier is swung out to reload. In Fig. 7 a small part of the face of the revolving stone is visible.

Movement of the Work-Carrier

The work-carrier—*A*, Figs. 6 and 7—is flexibly suspended from a crosshead *B* that moves by power up and down the guide-ways on the framework of the housing. The movement is brought about by a screw and nut, the screw being fixed to the crosshead, and the nut revolved, first in one direction and then the other, by open and crossed belts. The amplitude of the stroke is adjustable and the reversal of direction is brought about by the crosshead itself striking adjustable dogs on the upright reversing bar *C* at the right of the guide-way, to shift the belts.

By reason of its flexibile connection to the crosshead, the work-carrier is not only free to adjust itself to the face of the stone, but it may be turned face outward for reloading. It is shown in Fig. 6 in grinding position and in Fig. 7 it is turned around to be reloaded. *A* stack of files, *D*, Fig. 7, is held by the tangs, and wedged between two cheek pieces on the carrier. The grip on the file tangs is sufficient to keep them from being displaced while manipulating the carrier, and while they are being ground they are confined between the carrier and the stone.

Operating the Rollers

Two flanged rollers *E* are carried in a frame that is adjustable to and from the face of the stone by means of a screw and handwheel. Having loaded the carrier as in Fig. 7, the operator grasps a lever on the reversing bar *C* and raises the crosshead until the carrier is clear of the rollers. He then turns the carrier about-face, reverses the direction of movement and steers the lower wedge-shaped end between the rollers and the stone as Fig. 6 shows it.

The automatic reversing dogs, which up to this point have remained out of action, are now engaged, and the crosshead is allowed to travel up and down the guides at the rate of about 50 strokes per minute. Pressure to grind the work is applied by advancing the frame in which the rollers *E* are held.

(To be concluded)

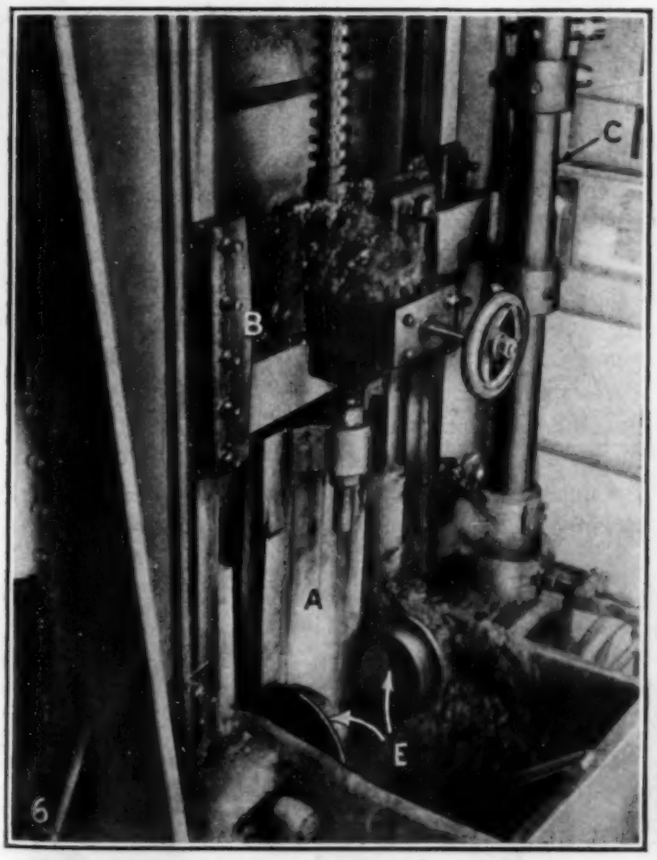


Fig. 6—Machine to grind file blanks—Grinding position.

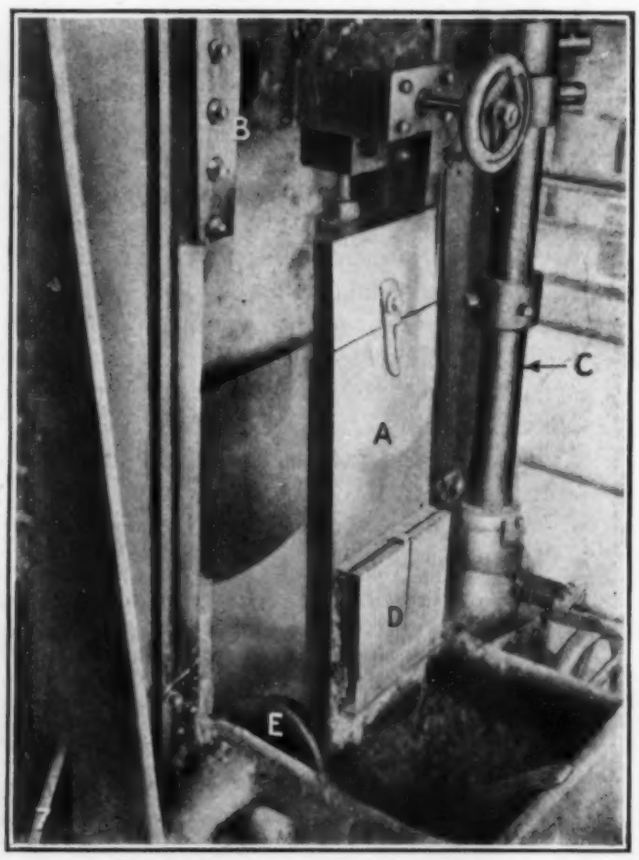


Fig. 7—Machine to grind file blanks—Loading position

THE · FOREMAN'S · ROUND · TABLE

Who Should Select New Equipment?

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"HOT-DOG, Al! Williams has bought the new planer. It'll be here in three weeks."

"Which one, Ed? The Sullivan or the Nixon?"

"Nixon."

"So you get the one you want after all. How does Charlie feel about it? He was set on a Sullivan."

"That's where I pat myself on the back, Al. I know Charlie wanted a Sullivan—and so long as he's going to run it, he would have had it, too, if he'd insisted; that's according to Williams' instructions, when both machines are up to snuff. But I sold him on the Nixon, and he can't see anything else, now."

"I feel the same way you do, Ed, that the Nixon is the better machine. But how did you convince Charlie?"

"I turned both salesmen loose on him, and then sent him over to Carrigan's, where both planers are in operation. Told him to watch three things, the hogging cut, the quality of finish, and the convenience of control. Told him to examine both lubrication systems, too. He came back favoring the Nixon."

"How did he get set on the Sullivan to start with?"

"Has a friend who runs one in some other shop—talks Sullivan planer all the time. Charlie admits he hadn't given the Nixon thorough consideration."

"Well, aside from the merits of the machines, Ed, what do you think of this idea of Williams, that the man who is to use a new machine must be satisfied with the one he's going to get?"

"I think maybe it'll work out in our shop, but not in others—Carrigan's, for example. Fact is, I think perhaps Williams went a little too far. Don't you?"

"Not the way he put it. You remember he said it's an experiment only. Reserved the right to alter a selection that's downright contrary to common sense, or if there is evidence of the wrong kind of 'influence.' I see what he's doing, though—trying to get away from equipment alibis, give more influence to the foremen, and keep everybody on his toes to discover the best machines there are. I'm willing to withhold judgment for a while—and of course I'm going to do everything I can for the plan."

"Me, too, Al, although I can't help feel that if a man gives you a job where he has to furnish the tools, he has a right to hand you the tools he wants to buy."

"Yes, but how about the advantages of the opinions of 500 men, say, against one—or against 12, if you include only the foremen?"

Is Williams going too far? What has he to gain, or what to lose, by letting the men influence the selection of new equipment? Are the men who operate the machines likely to know what is best? Is Williams, by his experiment, adding to or taking away from the influence of his foremen?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Should Foremen Be Good Actors?

NO, THEY should not be good actors but good friends and diplomats instead. From my own experience I can say that the blustering foreman may get action in a way but he will find little sympathy and friendly co-operation when things do not run along very smoothly. Even a roughneck like "Big Joe Slavinsky" will appreciate that quiet sincere way of Al, and when it comes to an emergency he will be right there working his head off for him.

The quiet friendly man will also have the advantage with new men because they will take to him while the blustering foreman will have all the newcomers sore at him from the start. Of course, they will find out after a while that Ed doesn't mean half what he says but, in the meantime, he will have to live down a bad reputation. According to my experience it wouldn't hurt Ed to change his tactics. He can calm down gradually and, while the men may notice it, the change will be to his advantage. I admit that a little coarse language may go better with some fellows, but the foreman should use his judgment and use coarse language, without shouting, only on those who do not understand fine words. If a foreman thinks of his men as working WITH him rather than FOR him he will automatically treat them as they ought to be treated. That is where diplomacy comes in. Nothing is more injurious to good team work than biting sarcasm. Avoid it, treat your men like friends and they will be your friends. It gives better results than the other method. If friend Ed will try it he will be surprised at his success. —J. C. P. BODE.

Taking Care of the Old Men

WHILE Williams' idea is good, many men cannot be employed on salvage work. I know of one large firm in England that has put half a dozen old machinists in the apprentice department to teach boys the trade, and it works well. But here again only a small number can be so employed, and the need is apparent for some definite provision for employees who have rendered long and faithful service to the firm. It ought not to be necessary for any skilled man to have to take a job as sweeper or watchman in order to live.

One of the best schemes I have come across to help provide for old age is that in operation at the De Laval plant at Poughkeepsie. This plan consists in the purchase of profit-sharing certificates by the employees. The subscription can be made twice a year, and the company guarantees 5 per cent interest. During 8 years the average interest paid has been 9.84 per cent. It encourages thrift, creates a real interest in the welfare of the firm, and provides a means of receiving a substantial income when the workman has grown old.

—ARTHUR SILVESTER.

Should Foremen Be Good Actors?

SINCE the men are probably used to Ed's making a noise whenever he wants to get something done they would likely be bewildered by a change unless it was very gradually made. The men will be quick to detect it when their foreman is only acting a part, and the more elegant language may be quite over their heads. It is the better policy for the foreman to "be himself" and to let acting remain where it belongs—on the stage. As for which will get the better results, the noisy foreman or the more subdued one, it really does not make much difference so long as the men know that their foreman is genuine, understanding his men and the work that they are doing. It was once my lot to work under a foreman who was very offhand. If I made a mistake I heard about it right away and in no uncertain tones, yet once referred to it was apparently buried for all time. It made me careful not to make the same mistake twice, too.

Later I worked for a smooth-tongued person whose forte was sarcasm couched in elegant language and delivered with a soft voice. Like a cat, he would almost purr one moment and strike out the next, not caring how much it hurt. No mistake was ever forgotten but was dragged out every once and so often to be dangled before the culprit's eyes. Nothing but lack of physical strength prevented me from giving him the thrashing he deserved. I prefer the bluff individual. Of course, there is a happy medium. —V. E. ATWELL.

Getting to the Big Boss

SINCE I have been master mechanic over from 200 to 1,000 men for the past eight years I have had any number of cases similar to the one outlined. My door is always open, but when a workman appears with a tale of woe my first question to him is, "Have you talked this matter over with your foreman?" About nine times out of ten his answer has been, "No I thought I had better see you first." I explain to him that this is the wrong procedure, and that I do not care to hear his case until he has talked with his foreman. It is seldom that I ever hear from such a case again as a real foreman has the authority to settle any question

THE : NEXT : TOPIC

Who Should Do the Discharging?

QUESTIONS

Should all discharges clear through the employment department?

Shouldn't the stigma of having been "fired" be avoided when possible?

Does it reduce his standing and authority in the eyes of his men if the foreman does not have the last word in discharging?

that a man may bring up, or at least he can come to me and get advice if it is out of his jurisdiction.

I think that there is nothing that causes more bitter feelings among foremen than to have a few men who know they can go and talk with the "Big Boss" if they are not shown consideration all of the time, and my personal opinion is, that any organization worthy of the name will be better off with such men outside of the gate, since they usually grow into the habit of disrespecting the foreman's authority. —J. H. WICKMAN.

Shop Visiting for the Foreman

FOREMEN have only a limited fund of ideas to draw from if their experience has been confined to one or two shops. Men of this type benefit from a visit to other plants because it increases their knowledge of methods and equipment. Such trips give them an opportunity to observe machines and fixtures which may be adapted to their own production problems.

The value of these trips to the company depends largely upon the factory visited, and also upon the mental attitude of the foreman. If the foremen know that some comment will be expected from them after the trip, they are more likely to consider it as business and not as a vacation. For this reason it is advisable to have a meeting after the return, at which time each man can submit his opinions and suggestions.

—H. KLINE.

Getting to the Big Boss

I TELL my men to go and see the "super" if the case warrants it, even if I myself am involved. He can judge both sides of the case, and can get a line on both the foreman and the one who has something to discuss with him.

Of course you will always find some one who will take advantage of this opportunity to be running to the big boss with every little thing that happens in the shop. When cases like this arise, I warn the employee that he is having his last chance, and after that handle him accordingly.

The one thing I always demand of my employees is that they tell me each time they wish to speak to the superintendent, and what subject they wish to discuss with him. —GEORGE BULL, JR., *Foreman.*

Cutting Down Spoiled Work

I HAVE always found that in every case of a large batch of spoiled work it was because of carelessness. Either the operator did not use his gages to check the work periodically, or in the case of press work he did not have gages to use. The press shop is one in which few gages are issued to check work, even though the tools are subject to heavy wear, and may be set to various pressures that produce variable results.

Al's plan of keeping spoiled work in such a position that the man should see it often, is good. It is one that I have used successfully, but I do not think it wise to go so far as to put on a label with the man's name.

—C. L. HENRY, *England.*

Getting to the Big Boss

WHY, in the case of a difference of opinion, should it be necessary to take a matter up with the so-called "big boss," if the foreman is supposed to handle such matters?

If the right kind of a foreman is on the job he will be big enough to settle questions. In order to do this he will have to secure the confidence of his men so that they feel he always has their best interest at heart.

Of course there are men who will not listen to reason. This is the time to suggest that they both go to the "big boss" and see how he looks at it. In the event it happens again the foreman will then be more able to convince the man. As long as we are dealing with human nature, friction will be set up when a matter is taken over the head of the one that is supposed to handle it. —ARTHUR A. MERRY.

Getting to the Big Boss

IT IS no small task to arrange things so that the men can talk to the man higher up without getting into trouble. Such interviews can become a nuisance. It could easily happen that the superintendent devoted all his time to talking with the men. And, of course, the thing will not be successful if hard feeling results.

In the first place, an announcement must be made that the principle of the open door has been established. If the superintendent makes it a little difficult for men to get to him, and can point out the waste of time if a man has come with too small a problem, very few will wish to see him.

The superintendent's task, however, will be to prevent foremen from bullying men who have gone over their heads to talk with the "big boss." Much can be accomplished by insisting that foremen may likewise go over the superintendent's head to the general manager. If a man behaves well a foreman will usually forget the incident, but if the man becomes arrogant as a result of what he thinks to be patronage he will deserve anything that may happen.

—C. J. FREUND, *Apprentice Supervisor.*

Getting to the Big Boss

IF DISCIPLINE is to be maintained, no workman should be allowed to take a complaint to the general manager. Rather, his case must be judged by his immediate superiors. The statement that a man is allowed to see the big boss any time may sound well, but there is no foreman who would allow a man to overrule his authority. I feel that if a foreman is a man worthy of his position, the question of his men wishing to see the general manager would never arise.

—JACK HILTON.

Shop Visiting for the Foreman

VISITS to other shops should give the foreman new ideas, and keep him from slipping into a rut. These visits will keep before him the fact that there is more than one way of doing a thing. He will also develop a flare for basic principles. Keeping mentally alert by

these occasional contacts with independent lines of thought, he will be saved from becoming "set in his ways" in his own shop.

Reports from the foreman on his visit may take the form of a written report, an informal note, or a verbal discussion. The latter is much the better way, as it will soon disclose the man who thinks in terms of vacations. The only resemblance between such a trip and a vacation will be the fact that they both are mentally refreshing. —W. E. ROTH.

Taking Care of the Old Men

UNDER ideal economic and social conditions the worker would reach financial independence before old age and lack of productive abilities. However, considering facts as they exist today in every long established firm old workers may be found.

Loyalty and long service are two arguments in favor of granting special privileges to these old timers. The wise farmer has a certain respect and love for his old horse or dog, and the wise employer should likewise be tenderhearted and considerate to the men who have helped him build his business. —R. SENAY.

Helping Your Men Get Better Jobs

I AGREE with Al's idea of obtaining a better job for one of his best men. It pays in more than one way. It is an inspiration for the rest of the men to do their best, knowing that they may also have a chance to better themselves. Besides, Tom will boost Al as a foreman, and also Al's company.

The benefit to the firm will easily offset the loss of Tom, because Al is still there, and there is always a better man to be found than Tom. I have always found when I lose a good man and think he cannot be beaten, that another man can be found who can do Tom's work better. —DAVID G. KALLSTROM, *Tool Supervisor.*

Helping Your Men Get Better Jobs

AL HAS a broad-minded superintendent in Williams, because if he tried to act as he did in some shops he wouldn't be able to get away with it.

The fact that Al has a man to take Tom Jackson's place shows that he is a good organizer. If I were in Al's place I would work along the same lines. If no opportunity for advancement seemed likely I would have a talk with the man and tell him just what his chances were if he stayed with us, and then tell him about the other job. If he took the job with the other firm I would do all I could to help him to success.

—THOMAS M. GARRY, *Foreman.*

Helping Your Men Get Better Jobs

WHEN Al aided Tom Jackson to get a better job with another firm he pulled off a neat bit of advertising. But the real value of Al's act to his company was in the encouragement imparted to the remaining men. These men acquired the feeling that their efforts would be rewarded even to the extent of having better jobs procured for them elsewhere when present ones were outgrown. No doubt Al's department showed a noticeable increase in production after this event became generally known.

Men of Tom's type cannot be held back, anyway, and will seek better jobs when possibilities for advancement become slight. It is better to have them leave as friends than with a grievance. —CLAUDE E. GASS.

More About Discipline in the Shop

AL'S method of punishing a skilled man by putting him on boy's work cannot be too severely condemned. From the man's viewpoint, Al's attitude conflicts with that which he assumed in the discussion on "Saving a Man's Face," and the foreman to be successful must be consistent.

Al will no doubt gain his end; but, speaking generally, his method would not result either in improved discipline or standard of work. It is more likely to have exactly the reverse effect, as has often happened in similar cases.

If a skilled man becomes too cocksure and commences to turn out shoddy work, a word of warning should be sufficient to prevent a repetition. If the man is on piece work, a return of all bad work will have the desired effect. —S. J. EDWARDS, *England.*

Helping Your Men Get Better Jobs

A MAN of Al's type is going a long way toward developing a better understanding and relationship between the employer and the employee. He is big enough to realize that he has a sprout in his garden that looks promising and to assist in transplanting this sprout to some other garden where it will grow when it is unable to grow in his own garden for lack of room or proper cultivation.

Tom Jackson's co-workers under Al are going to sit up and take notice. Tom's place will have to be filled and knowing what a "square-shooter" Al is, the rest of the gang are going to be on their toes. Tom is also going to send all the business to Al's firm that he can because he knows that a firm that treats its employees with such fairness will certainly be on the square with a customer. —J. M. CANNING.

Helping Your Men Get Better Jobs

THE foreman willing to sacrifice a "right hand man," for that man's betterment is a singular person indeed, although not as great a rarity as in the past. The act of a foreman in recommending one of his own crew to an outside concern, when he knows that the man's progress will be arrested if he remains where he is, is something that will have a far reaching effect on the whole organization.

Although the firm may be the immediate loser in such a case the reaction will be to its ultimate gain, due to the effect upon the other employees. Executives of this type inspire the men to such respect and admiration that they will usually give their best efforts at all times. —H. K. FLECKNER.

Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

A Progressive Die

BY JOHN STRAMA

The progressive piercing, blanking, forming and bending die illustrated in Fig. 1 was designed for producing the steel clamps shown in Fig. 2. The material used was cold-rolled strip steel 0.020 in. thick.

After the two holes have been pierced, the strip is fed to the blanking die, Fig. 3, where the ends only of the clamp are cut through the strip, the center part remaining intact. The opening in the die is without clearance, so that the knockout pad *A*, backed by the springs *B*, will operate therein. The punch *C* is sloped at the ends so that only the corresponding part of the stock will be cut through.

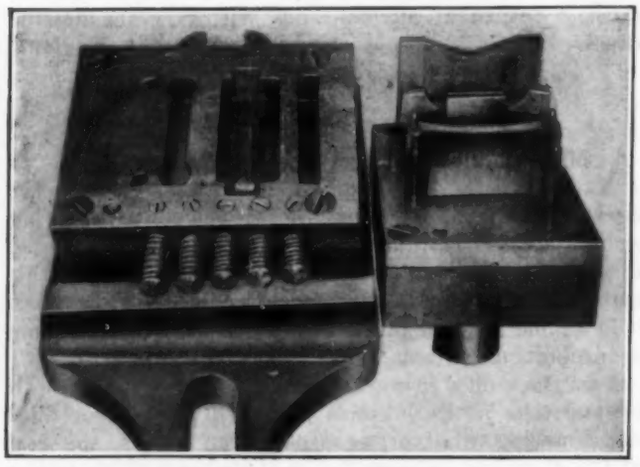


Fig. 1—The press tools

Fig. 2—The five sizes of clamps

The following die, Fig. 4, consists of the forming block *A*, the lift-out pads *B* and the springs *C*. In this die the ends of the clamp are bent to the proper radius, and the lugs for the screw and nut are formed.

The last-operation die, Fig. 5, shears the unblanked part of the clamp from the strip. The V-shape of the punch *A* curls the clamp as the shearing progresses, so that when fully severed it has taken the required shape. The punch is long enough so that at the completion of the operation, the clamp is pushed through the die and shoe and falls into a receptacle below the bed of the press. After completion of the first clamp, a finished clamp is produced at each stroke of the press. Five sets of dies of this type are in use for making the various sizes of clamps required. All the dies are used on presses operating at 60 strokes per minute.

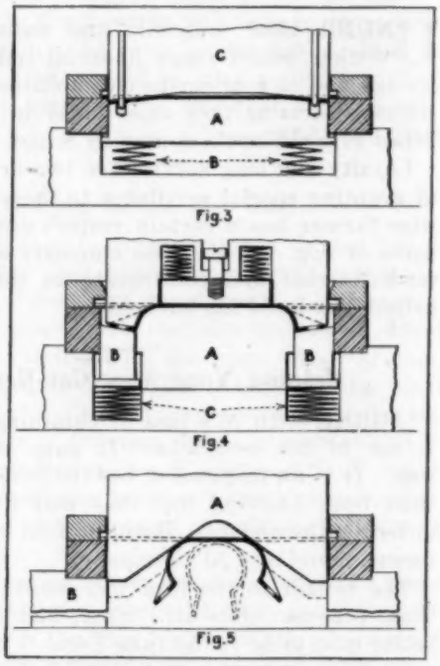


Fig. 3—Blanking die. Fig. 4—Bending and forming die. Fig. 5—Shearing and bending die

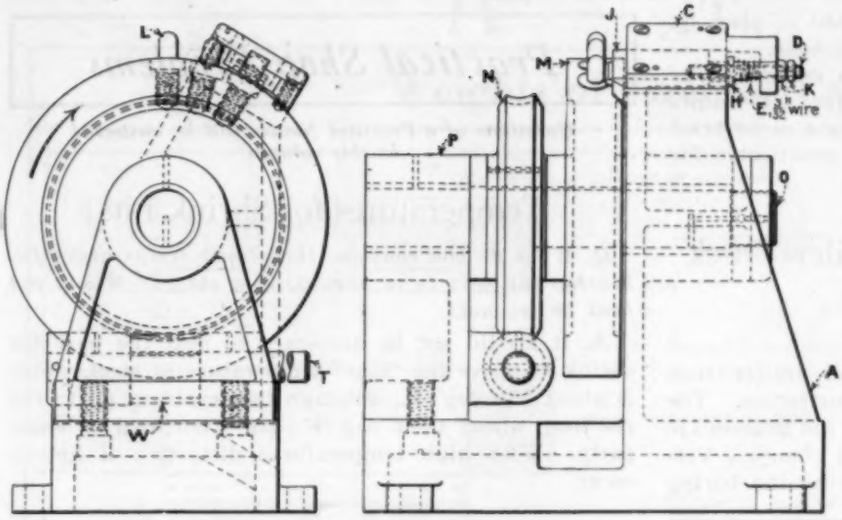
Machine for Marking Ferrules

BY J. E. FENNO

The machine shown in the illustration was designed for marking the ratings of fuses on brass ferrules. It was developed to take the place of a machine that was not altogether satisfactory, either in production or the quality of the work.

Integral with the base of the machine, is the bracket *A*, upon which the stamp-holding device is carried. The stamp *J* is a sliding fit in the bracket, and is confined in a slot therein by the cap *C*. The cap *C* has a right-angled projection at the end, through which the adjusting screw *D* is a clearance fit. The spring *E* through its action against the bushing *H*, exerts sufficient pressure on the stamp *J* to mark the figures on the ferrule. The screw *D*, locked by the nuts *K*, serves as a stop for the stamp.

The ferrule holders *L* are screwed in the dial *M*, to the hub of which is attached the wormwheel *N*. The dial and the wormwheel are attached to the shaft *O*,



Details of machine for marking ferrules

as a unit. The bracket *P* is attached to the bed of the machine, and provides a bearing for the shafts *O* and *T*, the latter carrying the worm *W*. Power is applied to the shaft *T*.

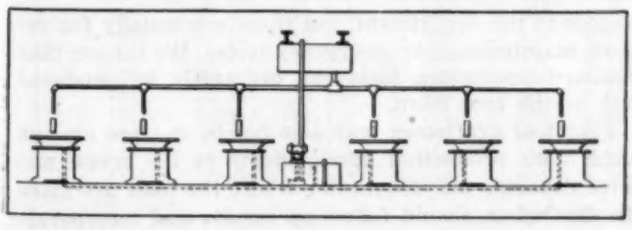
In operation, the ferrules are placed upon the holders *L*, and the revolving dial carries them past the stamp, thus marking the figures upon them.

Group Distribution of Cooling Compound

By Robert Julian
London, England

In the department where I am employed are six small cylindrical grinding machines, which were originally provided with individual tanks, pumps and piping to convey the cooling compound to the wheel and work. Though there were settling chambers, baffle plates, etc., in the tanks, the pipes leading to the wheel were continually clogging with grit, causing trouble and the expenditure of considerable time in taking them down to clean them. After enduring this inconvenience for a length of time, I decided to install a large central tank with a single pump to deliver the compound to all machines in the group. I accordingly had the system arranged as indicated in the accompanying sketch, with the result that our troubles from this source were practically eliminated.

A tank of 100-gal. capacity with baffle plates and settling basin, to prevent as far as possible the grit and dirt entrained in the liquid from reaching the pump, is placed on the floor at a point convenient for the purpose of distribution to all machines. Suspended from the timbers overhead is a similar tank of 200-gal. capacity, to provide a constant pressure by gravity to the system of piping. A single pump having a capacity of 15 gal. per min. against a 10-ft. head, replaces the six small pumps previously used, and is mounted on the lower tank. The one belt, considerably wider than the small belts of the individual pumps, and at a distance from the nearest machine, is not subjected to the continual splash of the compound, and consequently is longer lived and is easier to maintain, as well as being more efficient.



Distributing system for cooling compound

The supply pipes are of 1 in. diameter, running as directly as possible to the machines and delivering the liquid to the wheel through short flexible tubes, thus forestalling the tendency to clog that was inherent in the ¾-in. pipe and its many turns and fittings with which each machine was formerly provided. The larger pump is also more efficient than were the several small ones. Since the installation of this system, the work of maintenance has been reduced to a minimum.

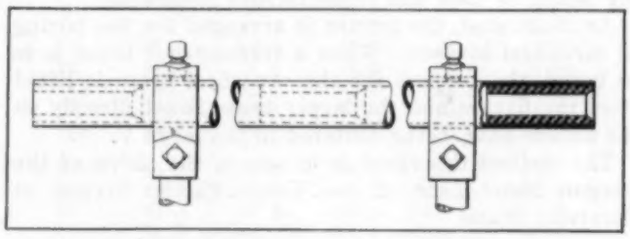
The trough of each machine is connected by suitable piping to a return pipe that is sunk below the level of the floor. From this common return pipe, a goose neck riser delivers the liquid to the lower tank. The height of the machines is sufficiently greater than that of the floor tank to provide the head necessary to insure an ample flow in the return pipes, which are provided with fittings and plugs at the ends to facilitate cleaning out any sludge that collects.

Fiber Pads in Stock Tubes

By Henry Simon

The rattling of the bar in the stock tube of a screw machine is a very disagreeable feature of this type of machine, and while some operators do not seem to mind it, there can be no question that an incessant noise of this kind tends to lower the efficiency of the men.

A way to eliminate this noise is by the insertion of



Fiber pads to eliminate noise

three sections of fiber tubing in the stock tube of the machine, as shown in the illustration. By using a tube as large as the supports will readily accommodate, it is possible to have these pads in the tube without unduly reducing the opening for the bar. The pieces of fiber tubing should be about three times as long as their outer diameter, and they should be turned to make a fairly tight driving fit. One end of the hole in each piece is beveled, while the opposite end is left square to enable the pad to be driven in place, the tube of course being used with the beveled ends pointing in the direction from which the stock is inserted. It is

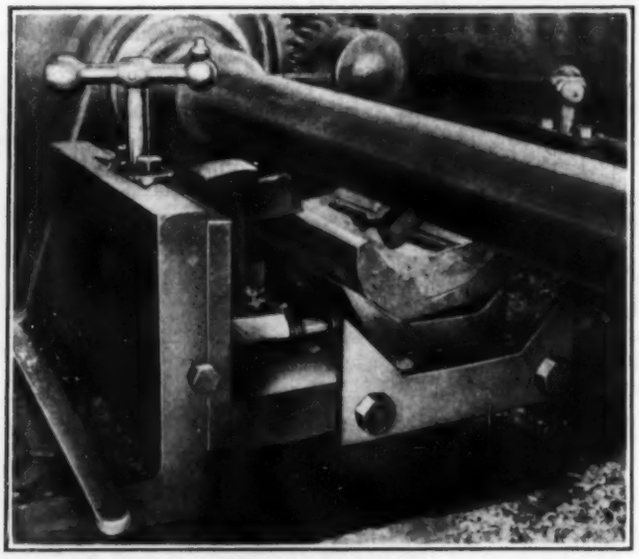
advisable to further secure the center pad in place by several pins tightly driven into the stock tube.

Where twelve-foot bars are used, this scheme works well for stock from ¾ to 1 in. in diameter, and results in practically eliminating the noise. I have never tried the plan on larger stock, and it is not practicable for very small stock.

Boring Car-Wheel and Trailer-Truck Brasses in a Lathe

BY J. MADISON

A method of boring car-wheel and trailer-truck brasses in a lathe is shown in the illustration. The fixture is supported on the carriage and the brasses are held in place by pneumatically-actuated clamps. Vertical feed screws, in front of and behind the boring bar, provide means for regulating the depth of cut, and for adjustment made necessary on account of the varying length of tools and irregularities in brasses.



Fixture with air clamps, used in boring car-wheel and trailer-truck brasses

As illustrated, the fixture is arranged for the boring of car-wheel brasses. When a trailer-truck brass is to be bored, the support for the car-wheel brass is lifted from the fixture and the larger brass is set directly on the fixture base, being centered in the large V.

The method described is in use in the shops of the Oregon Short Line of the Union Pacific System at Pocatello, Idaho.

Lubricant for Tapping Brass

BY OREN FOSTER

Kerosene is an excellent lubricant for use in tapping brass having a high copper content.

We had a lot of brass castings to tap and were up against it because the machine had hardly enough power to do the work. Then we tried kerosene as a lubricant, with the result that the machine drives the tap through the hole with ease, and without the necessity of backing the tap during the operation. The threads are clean and have a burnished appearance.

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

Temperatures for Shrink Fits

Q. What do you consider the proper temperature for heating the part to be shrunk on a shaft? Would red heat be too hot?

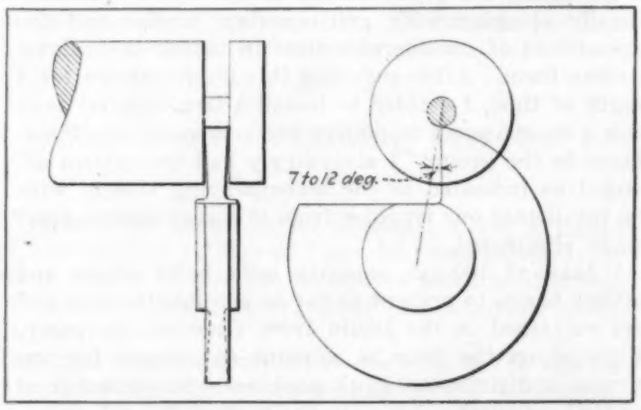
A. It should not be necessary to heat the part for shrink fit above the "blue" temperature of steel, which is about 570 deg. F., although temperatures up to the red heat, about 1,000 deg. F., are often used on small parts. With high temperatures distortion is apt to occur.

Making Screw Machine Tools

Q. How should circular cut-off tools be ground for best results on screw machine work? Our practice is to make drawings of all screw machine tools and have them made in the toolroom, but the screw machine foreman maintains that the toolmakers working on screw machine tools should be under his direction. Do you consider this a good policy?

A. The side clearance of the circular tool should be 2 or 3 deg. on each side in order to avoid a non-cutting tool surface in contact with the work. The face of the tool should be ground from 7 to 12 deg. below the radial line drawn from the center to the cutting edge. The proper clearances are shown in the illustration.

The attitude of your screw machine foreman might be interpreted as a play for more power, but investigation may show that he is not getting the best possible service from the toolroom. Where the screw machine department is of considerable proportions the practice is often followed of attaching one or more specialized toolmakers to the department, but these are usually for repairs, maintenance, or emergency tools. We believe that standard production tools can ordinarily be produced best in the tool room.

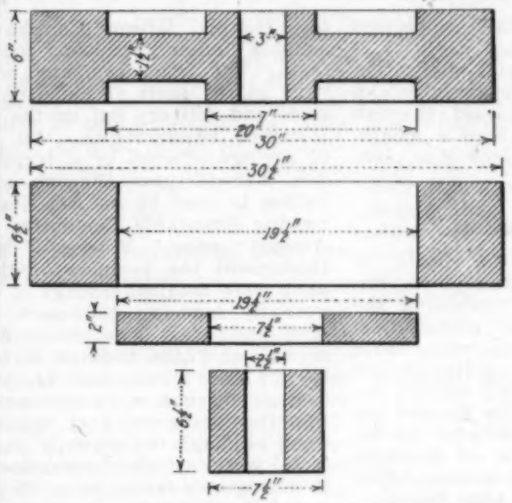


Clearances for circular cut-off tool

Your tool draftsmen may also not be in close enough touch with production developments in the screw machine department. No matter where the tools are made the draftsman should follow up results and incorporate all tool changes and grinding notations on his drawings.

Weights of Circular Castings

Application of Method of Calculation



Cast iron flywheel
Finish all over

Allow ¼ in. for finish on all surfaces

Weight in table of 30½ in. diameter = 190.0 lb.
" " " " 19½ " " = 77.7 "
712.5 " x 6½ = 729.96

Weight in table of 19½ in. diameter = 77700 lb.
" " " " 7½ " = 11,486 "
66,214 " x 2 = 132.63

Weight in table of 7½ in. diameter = 11,486 lb.
" " " " 2½ " " = 1,276 "
10,210 " 6½ = 66.36

Weight of flywheel 928.95 lb.

Diam.	Weight in Pounds per Inch of Length: Cast Iron	Wrought Iron and Steel	Common Yellow Brass	Bronze	Aluminum
1	.204	.220	.237	.251	.072
1¼	.319	.344	.370	.392	.113
1½	.459	.497	.533	.565	.163
1¾	.625	.677	.725	.768	.222
2	.817	.885	.948	1.005	.291
2¼	1.034	1.118	1.195	1.268	.367
2½	1.276	1.380	1.480	1.570	.454
2¾	1.544	1.672	1.790	1.895	.550
3	1.837	1.988	2.130	2.260	.654
3¼	2.157	2.333	2.505	2.650	.767
3½	2.501	2.710	2.900	3.075	.890
3¾	2.871	3.105	3.330	3.530	1.022
4	3.267	3.548	3.800	4.020	1.163
4¼	3.688	4.000	4.280	4.540	1.314
4½	4.135	4.470	4.790	5.090	1.471
4¾	4.607	4.980	5.350	5.670	1.640
5	5.105	5.530	5.930	6.280	1.820
5¼	5.628	6.080	6.540	6.925	2.000
5½	6.177	6.680	7.160	7.570	2.200
5¾	6.751	7.310	7.840	8.300	2.400
6	7.351	7.960	8.530	9.040	2.615
6¼	7.977	8.640	9.270	9.820	2.840
6½	8.627	9.340	10.000	10.611	3.070
6¾	9.304	10.067	10.792	11.444	3.315
7	10.000	10.820	11.600	12.300	3.560
7¼	10.733	11.613	12.400	13.150	3.820
7½	11.486	12.450	13.330	14.140	4.080
7¾	12.265	13.260	14.200	15.070	4.360
8	13.069	14.120	15.150	16.050	4.650
8¼	13.898	15.020	16.130	17.100	4.950
8½	14.754	15.960	17.130	18.300	5.250
8¾	15.634	16.900	18.100	19.200	5.570
9	16.540	17.900	19.200	20.350	5.880
9¼	17.472	18.900	20.300	21.500	6.220
9½	18.429	19.930	21.350	22.650	6.550
9¾	19.412	21.000	22.500	23.850	6.910
10	20.420	22.100	23.630	25.100	7.270
10¼	21.454	23.250	24.900	26.400	7.630
10½	22.513	24.350	26.100	27.700	8.000
10¾	23.598	25.550	27.400	29.000	8.400
11	24.708	26.750	28.650	30.500	8.780
11¼	25.845	27.950	29.950	31.800	9.200

Diam.	Weight in Pounds per Inch of Length: Cast Iron	Wrought Iron and Steel	Common Yellow Brass	Bronze	Aluminum
11¼	27.006	29.250	31.350	33.200	9.620
11½	28.192	30.500	32.700	34.700	10.000
12	29.406	31.850	34.150	36.200	10.470
12¼	30.644	33.150	35.500	37.700	10.900
12½	31.907	34.500	37.050	39.300	11.350
12¾	33.197	35.950	38.500	40.800	11.800
13	34.510	37.350	40.000	42.450	12.275
13¼	35.851	38.800	41.600	44.100	12.750
13½	37.216	40.25	43.2	45.8	13.25
13¾	38.607	41.57	44.8	47.5	13.74
14	40.024	43.3	46.4	49.3	14.23
14¼	41.465	44.8	48.	51.	14.74
14½	42.934	46.4	49.8	52.8	15.28
14¾	44.426	48.	51.5	54.7	15.80
15	45.945	49.7	53.3	56.5	16.35
15½	49.059	53	56.8	60.3	17.45
16	52.260	56.4	60.6	64.3	18.57
16½	55.5	60	64.5	68.3	19.75
17	59	63.8	68.5	72.6	21
17½	62.5	67.6	72.5	76.9	22.25
18	66.2	71.6	76.8	81.4	23.55
18½	70	75.7	81.3	86.2	24.9
19	73.6	79.5	85.5	90.6	26.2
19½	77.7	84	90.3	95.6	27.7
20	81.5	88.2	94.5	101	29
20½	85.7	92.7	99.6	106.3	30.5
21	90	97.3	104.4	111.5	32
21½	94.3	102	109.4	117	33.5
22	98.8	106.7	114.7	122.5	35.2
22½	103.5	112	120	127.4	36.8
23	108	116.7	125.3	133	38.5
23½	112.7	121.5	130.7	138.5	40
24	117.5	127	136.3	144.6	41.8
24½	122.5	132.4	142	150.7	43.6
25	127.8	138	148	157	45.5
25½	132.8	143.5	154	163	47.3
26	138	149.2	160	170	49.2
26½	143.2	154.5	166	176	50.4
27	149	161	173	183.2	53
27½	154.2	166.5	178.7	189.5	54.8
28	160	173	185.7	197	57
28½	166	179.5	192.5	204	59.2

Contributed by F. A. Firnhaber

(To be continued)

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Technical Abstracts

Goodwill Is Steel Company Aim

The Commonwealth Steel Co., Granite City, Ill., uses what is known as the "Commonwealth" plan to see that justice and equal opportunity are assured its employees. Each of the fourteen voting divisions of the plant elects three representatives who constitute a shop committee. The chairmen of these committees constitute a general committee which holds a stated meeting each month attended generally by representatives of the management. Problems concerning plant regulations and personnel relations are taken up. Upon vote of this general committee a recommendation may be made to the general manager who can put it into execution or refer it back to the committee. Should the committee's recommendation then remain unchanged, the question is referred to the president of the company for decision.

Safety work in the Commonwealth plant has reduced the accidents by 80 to 90 per cent. There are safety committees but foremen are held responsible for the prevention of unsafe practices. Constructive suggestions are counted upon as the best weapons with which to fight against carelessness and unsafe methods. The safety activities are carried on by a program of understanding and protection, the policy of inducing fear being avoided. Aside from the human element the company has provided everything possible in the way of guards for machinery and for other mechanical devices.

To supply educational news the Commonwealth school, twenty years old, is maintained. It now offers a complete high school technical course.

Full high school credits are required of apprentices. They are assisted to attain such qualifications by the company school. Candidates for apprenticeship positions are examined mentally and physically and are appraised as to character and aptitude.

Get-together dinners presided over by company officials or student officers of the school are held frequently. There is an employees' benefit association. A home purchasing fund is available for assistance to employees who need help in financing the building or purchasing of homes. The company has promoted a savings club. A fellowship club housed on the company's premises is open to male employees. Colored employees have their own fellowship club.

In co-operation with the residents of Lincoln Place the company has built a community house which renders educational service to the foreign born of that section of Granite City. There are classes in English, American citizenship and sewing. A commissary department is maintained by the company. It includes a shoe department where new shoes may be bought and old ones repaired. Injured employees are treated in the dispensary.

In addition to the official publication known as the "Commonwealth" a "home edition" is circulated through employees homes about once a month. —Burnham Finney, in *Iron Age*, Jan. 27, 1927.

Company Standardization

Standardization is the basis of American success in industry. A European publication, in explaining the domination by American manufacturers of some of its markets, while other sections were controlled by British and continental manufacturers, pointed out that the manufacturers in Europe are quite unable to compete with us because in the fields which we dominate our standardization makes competition impossible; it explained that the markets which American manufacturers are unable to take over are in fields in which American manufacturers have made little progress along the lines of standardization.

When a company makes a place for itself not only in this country but also abroad, we may look for a high degree of standardization as a significant factor. The Palmolive Co. has reduced its production to the "one best way," and has standards for machine set-ups, for product formulas, for raw materials, and for the testing of the product. The Ford Co. owes its success abroad to rigid adherence to standards of production and performance. An overwhelming proportion of the references to individual company standards in the *National Directory of Commodity Specifications* published by the Department of Commerce bear the names of our leading railroads. Their standards apply to the watches used by employees in control of train operation, to the color and design of signal lights, to track gage, and to couplers as well as to many other details.

The General Motors Co., for example, has to date published two large loose-leaf books of standards totaling upward of 350 sheets. Over 19,000 specifications have been published in the standards book. This work is coordinated in a standards section of the corporation's general purchasing committee, the membership of which includes executives and purchasing agents of its major manufacturing divisions and subsidiaries. A vice-president of the company is chairman of the committee, and all staff activities are directed by an executive secretary. Many of the manufacturing divisions of the corporation have standards engineers whose authorizations are required upon departures from the adopted standards. Great savings have been made through rigid adherence to the code of parts and materials standards as adopted by the central bureau.

The International Harvester Co. and the Detroit Edison Co. have both adopted similar purchasing control systems. The latter company no longer buys on the basis of name only or of price and delivery but on the basis of standard requirements. An instance of savings effected by a large American manufacturer through standardization is cited by an American Engineering Standards Committee bulletin. Among seven instances scattered throughout the business of this company were detailed savings of $3,000 a year by reducing 130 stock sizes of steel and brass washers to 64 sizes; savings of $7,500 through standardization of office forms; over $4,000 annual savings through a 50 per cent reduction in the varieties of wood screws used, although the plant is engaged in metal working; standardization of files, involving an elimination of 85 per cent, saved about $7,000 a year, and so on.—P. G. Agnew, in *Factory*, Jan., 1927.

Refinements Mark Foundry Progress

A few of the larger foundries made sweeping changes in plant equipment during the year just ended. The substitution of machine methods for human labor, wherever possible, summarizes the intent of these changes.

In the automotive foundries, the use of power-driven, mold-conveying equipment with gravity roller-conveyors for the return of idle flasks and sundries has become practically standard. Improved methods of sand preparation and handling have also been adopted.

In cast-iron pipe foundries, the more general adoption of centrifugal casting methods has been pronounced. One foundry has been equipped with eight machines for using rotating, water-cooled metal molds. A southern pipe foundry has completed a new plant equipped with twelve machines for casting pipe centrifugally in green-sand molds. An eastern foundry, similarly equipped is being completed. The production by this method is said to be from six to ten pieces per machine per hour.—D. M. Avey in *Iron Trade Review*, Jan. 6, 1927.

Electric Lifting Magnets

An economical method of handling iron and steel in both the raw and finished states is by means of lifting magnets, and where a good type of magnet is installed the cost can be recovered well within a year, while thereafter the cost of operation often does not exceed 25 per cent of the older methods.

The rise in coil temperature is the limiting feature in magnet design. If the rise is too great the efficiency will be reduced owing to the increase in coil resistance. Hence, to secure maximum efficiency for all-day periods, it is necessary to have a magnet in which

the heat of the coils will be quickly conducted to the outside of the body.

The circular magnet is not the most suitable form for handling large plates owing to the fact that the natural flexure of the plate tends to tear it away from the magnet, and to meet this need the rectangular type has been developed. Nearly all troubles with magnets can be traced to moisture, which weakens the effectiveness of the insulation. It is necessary not only to guard against moisture in the form of rain, snow, or dew, but precautions must also be taken against any moisture-laden air that might condense inside the magnet.—*The Electrician*, (London), Dec. 31, 1926.

Use of Worm Reduction Unit for Power Transmission

A feature of the modern worm gear reduction unit that is especially important is its ability to maintain high efficiency throughout its life. On some units the worm threads are hardened and ground, and the meshing gear is made of high-grade phosphor bronze. Any wear must, therefore, occur on the gear teeth, and since these teeth are cut by the hobbing method, the action of the worm threads on the teeth is exactly the same as the hob that generated the original tooth contour. Even after considerable wear has occurred, and this should be retarded by adequate lubrication, the meshing surfaces bear exactly the same relation as the threads.

The use of high-grade anti-friction bearings on the two shafts of industrial worm-gear speed-reducing units, has been an important factor in their successful performance. The use of these bearings for both shafts, not only increases the overall efficiency of the drive, but also adds to the durability of the mechanism. Worm gearing, in order to maintain its efficiency over long periods, must be held accurately in alignment. For long life and reliable efficient operation, the prevention of bearing wear is more important than the prevention of gear wear.—G. H. Acker, in *Industrial Engineer*, January, 1927.

Overtime and Wage Incentives

The Atlantic Refining Co. pays overtime on incentive wage rates in order to compensate the 100 per cent efficiency worker for the additional physical cost of overtime equally as well as the ordinary day worker. In this way men being paid under both systems can work together on Sundays and holidays without dissatisfaction. Incidentally, such a scheme discourages management from having such overtime work occur. The incentive worker on a long stretch of overtime will earn little or nothing over his base rate plus overtime and he actually loses the efficiency reward, to which he is properly entitled if working a normal day. In all events, strictly manual labor operations when on an incentive basis should be forbidden for periods in excess of about twelve hours. It is believed from tests that after two or three hours of overtime, the average efficiency of a worker over the entire working period will have dropped to such a level that the loss of bonus will completely offset time-and-a-half payment for overtime.

Answers to a questionnaire sent to twenty companies in regard to the method of paying overtime in connection with piece rate indicated that seven paid piece rate plus one-half hourly rate; one paid piece rate plus one-half of average earnings; one, piece rate plus 10 per cent; five, straight piece rate; four, straight time and a half; and two paid no piece rates at all. The average size of the plants reported paying piece rates plus one-half the hourly rates is considerably larger than the average size of the other plants reporting. The answers also indicated that when piece rates are installed overtime becomes quite infrequent.—L. A. Sylvester, in *Manufacturing Industries*, January, 1927.

Electric Melting Furnaces

The trend of electric furnace development for the melting of metals is now said to be on a sound economic basis. The electric furnace is no longer considered as a "cure-all," and its limitations as well as its peculiar assets are now recognized.

The advent of the electric furnace has been responsible for the rapid advance in high grade alloy and tool steels, and the economic production of these steels, except crucible steel, is almost impossible in fuel-fired furnaces. More than 52 per cent of all steel plants in the United States and Canada are equipped to produce electric steel castings.

The electric furnaces for melting gray iron and malleable iron are receiving more attention. Cast iron was long considered as a low-grade product to be made as cheaply as possible, but this idea is now changed, and high-quality iron as produced in the electric furnace is recognized as being of finer grain, and being stronger and tougher. For such purposes as piston rings, where the finished product sells at several thousand dollars a ton, the slightly increased cost of melting is overshadowed by the question of quality.

In the melting of non-ferrous metals the electric furnace is constantly gaining headway. It gives better control of composition and temperature, and better working conditions. The changes and improvements in electric-furnace development comprise more highly powered units, improved linings, greater simplicity and reliability in electrode control, and higher frequency heating. —*The Blast Furnace and Steel Plant*, January, 1927.

Preferred Numbers

In order to develop a standard line of power presses, study was made of previous machines and it was found that the series were related in geometrical progression. This, therefore, was taken as the basis for establishing future lines of machines and calculations were thereby greatly reduced. Once a certain size is determined, the value for other sizes can be quickly figured.

For eccentric presses the cutting pressures and corresponding power requirements were placed in a geometrical series and since these are the deciding factors in the dimensioning of the individual machine parts, these dimensions were also placed in a geometrical series. From a determination of the section of the frames it was found that the moments of inertia and section moduli also formed a geometrical series, as did the dimensions of journals and shafts. This system of preferred numbers became the manufacturing standard. Fits were also placed on such a basis and resulted in standardization of gages.—A. Herb, in *Mechanical Engineering*, Jan., 1927.

Using Meters Improves Efficiency and Reduces Investment

By knowing the quantity of steam power used, it is possible to operate a power plant so that a direct saving is effected. The operators and attendants can use more skill in their art with graphic records constantly before them, resulting in a better product. Electric meters are distributed so that segregation of cost is readily obtained.

Steam produced by the boiler plant is checked roughly in two ways. First, by comparing the total steam production with the feed water consumption; secondly, by comparing the total production as obtained from the individual boiler meters. Boilers are equipped with integrating, recording and indicating meters; the latter being mounted on the boiler front and are calibrated in boiler horsepower. Coal is weighed to each boiler by means of a weigh-larry operated in conjunction with an overhead bunker, and the weigh tickets are totaled and recorded for each shift.

By the use of meters, it has been possible to increase the boilers' rating greatly and at the same time improve the evaporation per pound of coal on an average of about 33 per cent. Not only has this resulted in larger savings in operating costs, but also it has allowed supplying a large increase in steam demand without enlarging the plant, as would have otherwise been necessary.—H. W. Gochnauer, in *Power*, Jan. 25, 1927.

Making Employees Partners

Selling stock to employees is a policy that has become widely adopted. More than 3,200 industrial firms now sell stock to employees on partial payment plans, and one large public utility has sold 86 million dollars worth of stock to its workers. Some companies have no eligibility requirements for buying. Others require periods of service ranging from 2 months to 5 years, while others establish minimum salary requirements. The usual practice of payment is to deduct the installments from the earnings on established pay-days, this amounting in some cases to $1 per share per week. The standard practice of redemption is to buy back at the price sold plus interest ranging from 4 to 7 per cent.—*Canadian Machinery and Manufacturing News*, Jan. 27, 1927.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Helping the Farmer

NEGLECT of machinery is an economic waste, no matter where it occurs. Although the owners of small shops are less able to afford this waste than those with more capital there is probably a much higher percentage of waste in such shops than in large factories.

Farmers are seeking and receiving much sympathy because they are not supposed to be getting their share of the country's prosperity. But there seems to be little doubt that part of the trouble at least, lies at their own door. They are generally neglectful of their farm machinery.

A recent trip in the Middle West revealed an appalling amount of machinery being ruined in this way. Thousands of dollars worth of reapers, mowing machines, binders, hay rakes and cultivators was seen in a single afternoon standing in open fields, covered with snow.

It is not only the deterioration of the machinery. The loss due to its failure to work properly when urgently needed will take a heavy toll from the farmers' time and profits later in the year.

Here is an opportunity for the farmers to increase their net earnings. It requires no legislative action and is much more apt to give beneficial results than many of the proposed remedies.

The Inch

MOST of us have heard so much against the homely inch, and for the scientific meter, that we have almost been backed into the position of the art observer who admitted she didn't know art but stoutly maintained that she knew what she liked. But now we are encouraged by support of the inch as a measuring unit from a new source. An archaeologist, who is also a civil engineer, has made careful measurements of the great pyramid of Cheops, built some 4,000 years ago, and has discovered some very remarkable things.

Leaving out all of the queer coincidences of dates, prophecies fulfilled, and measurements of various features of this marvelous structure as interesting but irrelevant just now, we learn from him that the unit of measure used in the construction of the great structure is an inch almost identical with our inch. He points out further that the pyramid inch is an exact division of the polar axis of the earth. The straight line connecting the poles is 500,000,000 of these inches long. And what is more, the pyramid inch is a scientifically exact quantity whereas the meter is not a ten-millionth part of the earth's quadrant because somebody made an error in the original calculations.

Apparently our faithful old friend, the inch, has a better claim to scientific accuracy than its enemy, the meter. Here is some choice new ammunition to fire at the advocates of compulsory metric legislation.

Pinning Faith to Modern Equipment

TWENTY-FIVE MILLIONS spent in two years for modern equipment. Twenty-five millions to cut costs, without increasing production capacity a single ton. Such has been the program of the Youngstown Sheet and Tube Co., according to James A. Campbell, its president. Adverse railroad rates and competition for abroad were given as factors affecting marketing and making drastic cost cutting necessary.

"Almost overnight it may be necessary to scrap costly equipment and replace it with new machinery," said Mr. Campbell. What a lesson may be learned by the machine-using industries from this steel mill's experience.

Modern equipment is the answer to the competition problems of many manufacturers. The story has been told repeatedly in the "American Machinist"; its truth has now been emphasized by these gigantic expenditures for equipment.

New Wine in Old Bottles

RESULTS rarely depend upon a single factor. The most economical production cannot be secured by putting new cutters on a decrepit machine. A recent instance shows the necessity of knowing how tools are to be used before even guessing at the results to be expected.

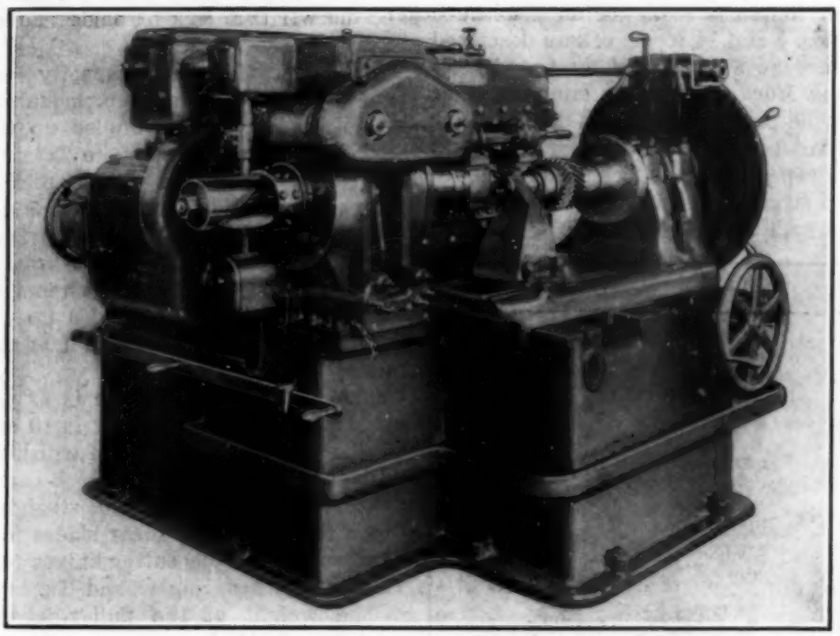
High-speed milling cutters of modern design were ordered and delivered. Complaints soon found their way into the cutter maker's mail and a cutter engineer was sent to investigate. He found that high-speed, coarse-tooth cutters had been put on machines of ancient vintage, with light spindles in loose bearings. Light tables could not hold the work firmly and unsteady feeds made it impossible to get results at all satisfactory. Instead of high production, the principal result was broken cutters. In order to get results at all satisfactory, old-type, fine-tooth cutters had to be supplied.

Money would have been saved and irritation prevented if all the conditions had been known and considered before the first cutters were made. Economical production requires good machines, good cutters, good fixtures and good management. No single factor will give satisfactory results. All must be considered.

Shop Equipment News

Sykes Improved Gear Generator

SEVERAL changes and improvements have been made in the design of the Sykes gear generator built by the Farrel Foundry & Machine Co., Buffalo, N. Y., to enable larger cuts to be taken and higher cutting speed to be obtained. The machine shown in the accompanying illustration is made in three sizes to cut gears up to 24, 36 and 48 in. in diam., respectively. The improvements are said to permit the production of some types of gears in one-third of the previous cutting time and any gear within the capacity of the machine in one-half of the time previously taken. The machine will cut straight-tooth gears, helical gears, staggered-tooth double-helical gears, and continuous-tooth Sykes gears.



Sykes Improved Gear Generator

The work saddle and tail bracket have been strengthened and the reciprocating carriage has been designed with a deeper box section to give it more rigidity and greater bearing surface on the cutter bed. This design also permits an oil well to be incorporated in the cutter bed so that the carriage will be amply lubricated at all times. The cutter head has a longer base, and the bearing surfaces are covered by the keep plates, which prevent dirt or chips from affecting the accuracy of the ways. The feed gear box has been extended to the top of the machine to include all of the moving parts of the relief mechanism and to lubricate them automatically.

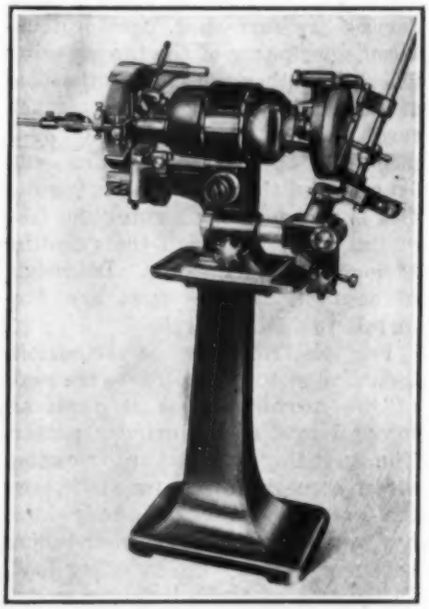
An automatic feed mechanism has also been fitted to the work saddle. By means of this device, the saddle holding the blank is fed into the cutters and stopped when the correct tooth depth has been obtained. The helical guides are of cylindrical design, and, by means of an improved method of fastening them to their respective cutter spindles, the guides can be quickly changed from helical to straight form when it is desired to cut straight tooth gears.

Other improvements include the introduction of ball bearings and the automatic lubrication of all moving parts where practical. A complete range of arbors, faceplates, driving dogs, cutter tail brackets, centers for shafts, chucks, and the like are regularly furnished with the machine. In addition, there is supplied a gear-tooth comparator, together with gage blocks that are accurately made, graduated squares for gaging the apex of the teeth, and a large number of change gears.

"Grand Rapids" Combination Tap and Drill Grinder

The "Grand Rapids" combination twist drill and tap grinders are being made in four sizes by the Gallmeyer & Livingston Co., Grand Rapids, Mich. Either belt drive or integral motor drive, as shown in the accompanying illustration, can be supplied. The style 10-A machine has a capacity for grinding drills ranging in size from No. 52 to $\frac{3}{4}$ in. and taps from No. 6 to $1\frac{1}{4}$ in.; style 10-B handles drills from $\frac{1}{8}$ to $1\frac{1}{4}$ in. and taps from No. 6 to $1\frac{1}{4}$ in.; style 20-B has a capacity for drills ranging from $\frac{1}{8}$ to $1\frac{1}{2}$ in. and for taps ranging from $\frac{3}{8}$ to 3 in., while style 20-C has a drill capacity of $\frac{1}{4}$ to $2\frac{1}{2}$ in. and a tap capacity of $\frac{3}{8}$ to 3 inches.

It is said that drills can be sharpened properly on one of these grinders quickly and conveniently, as there are almost no adjustments to get out of order in normal service. It is only necessary to adjust the tailstock to accommodate different



"Grand Rapids" Combination Twist Drill and Tap Grinder, Motor-Driven Model

Shop Equipment News

lengths of drills being ground. No adjustment of lip rests is required, and it is not necessary to make any changes for drills of varying diameter or when changing from straight shank or taper shank drills. The drill is held in the holder with one hand while the tailstock is brought up into position and clamped by the other hand.

By means of a patented holder stop that works in connection with a diamond trueing device, the drill is placed in the correct position with relation to the grinding wheel, and it is impossible to get the holder so close as to damage the lip rest.

The tap grinding device is used for grinding the taper at the end of the tap, and the clearance back of the cutting edge thus formed. This taper may be long as in nut taps, short as in plug taps, or negligible length as in bottoming taps. The convex clearance provided is in the form of an arc of a circle struck from a point on a radius laid out at a predetermined angle in relation to the radius of the cutting face of the flute. It is said that taps sharpened in this manner will cut with half the power required for hand-sharpened taps.

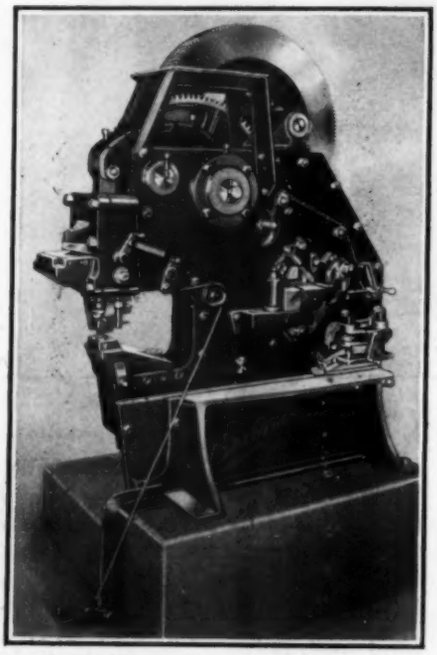
Both sides of this combination machine are equipped with a diamond wheel trueing mechanism. In the case of the Nos. 10-A and 10-B machines, two types of wheel trueing devices are furnished, one for trueing the periphery of the tap grinding wheel, the other for trueing the face of the drill grinding wheel. In the case of the Nos. 20-B and 20-C machines, both wheels are cup shaped, and the diamond trueing device is arranged for keeping the face of the wheel on which the grinding is done in proper shape. Diamonds of approximately ½ carat are furnished for each wheel.

For electric drive a repulsion-induction motor is built into the head of the machine so as to form an integral part of the grinder proper. The grinding wheels are mounted directly on the armature shaft, and the special motor end bells have heavy ring-oiled, phosphor-bronze bearings to carry the grinding load. In the case of the belt-driven model, an overhead countershaft having a self-oiling, loose pulley and babbitted bearings is supplied.

All four models occupy a floor space of 2x3½ ft. The spindle speed in each case is 1,600 r.p.m., and the wheel diameters are 8½ and 10 in. The belt-driven models, Nos. 10-A and 10-B, weigh 385 lb., net, while the belt-driven models Nos. 20-B and 20-C weigh 400 lb. net. The motor-driven models weigh 50 lb. more in each case.

Buffalo No. 0 Universal Iron Worker

The No. 0 Universal Iron Worker made by the Buffalo Forge Co., 490 Broadway, Buffalo, N. Y., operates on the same principle as the larger Nos. ½ and 1½ iron workers described on page 879, Vol. 64, of the *American Machinist*. Some simplifications made possible by the smaller capacity have been introduced and the speed of operation has been increased to 35 strokes per minute. This machine is particularly designed for working



Buffalo No. 0 Universal Iron Worker

light stock used in the fabrication of metal grill work, railings, fire escapes, window frames, steel furniture, filing cabinets, fire doors, kitchen ranges, electric signs, and the like.

As in the larger machine, an "Armor Plate" special rolled-steel frame is used for lightness and strength. The shear blades are made of crucible steel and have four interchangeable cutting edges. Five-piece bar cutter knives are supplied to make sharpening and replacement easy. Knives can also be furnished for special shapes.

Optional equipment includes a triple punching attachment, a notcher for angles, I-beams, Ts, channels, Zs, plates, flats, and other rolled shapes. This notcher does not interfere with the regular punch, shear and bar cutter.

The machine will punch holes ⅝ in. in diam. by ½-in. deep or ¾ in. in diam. by ⅜-in. deep in channels or I-beams with flanges ranging from 3 to 8 in. in depth, or in webs ranging from 3 to 10 in. wide. It can shear ⅜-in. plate and 4 x ½-in. flats, and will trim legs of angles up to 2½ inches.

The bar cutter has a capacity for rounds up to 1¼ in. in diam.; squares up to 1⅛ in.; square angles up to 3x⅜ in.; mitre angles up to 2x¼ in. and Ts up to 2½x¼ in. With special knives, beams and channels up to 5 in. can be cut. With special tools the machine will cope square I-beams ranging from 3 to 6 in.; channels from 3 to 5 in.; and angles up to 3x⅜ in. It will also notch 90-deg. angles up to 2x¼ inches.

The height of the stroke is ⅞ in., and the depth of the throat is 10 in. The equipment regularly furnished with the machine includes ⅝- and ¾-in. round punches, a ¾-in. straight die, a ⅝-in. bevel die, shear blades for flats and plates; bar cutter knives for rounds, squares, angles and Ts.

The weight of the pulley-driven model is 2,200 lb. The weight of the motor-driven model is 2,300 pounds.

Milburn Type LPG Oxy-Illuminating Gas Cutting Torch

The Alexander Milburn Co., 1416 W. Baltimore St., Baltimore, Md., announces the type LPG cutting torch for use with city gas, natural gas, or by-product coke-oven gas. The torch is designed for cutting heavy plates, risers, gates and billets with a gas pressure of 4 in. of water.

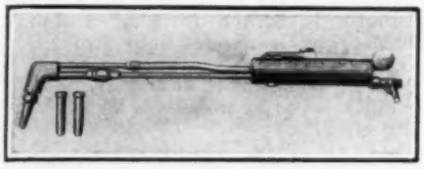
Tests have shown that the torch can be successfully used with by-product gas as it comes from the coke oven without being scrubbed. With such a gas of low B.t.u. content a speed averaging 1 ft. per min. is obtained on 3-in. plate using oxygen

Shop Equipment News

at a pressure of 40 lb. per sq. in. and the gas at ordinary line pressure.

Cuts made with this torch show a clean, sharp edge devoid of slag on the underside. The kerf is narrow and the surfaces smooth. It is said that the surfaces do not caseharden, so that the machinability of the metal is not affected.

The torch is made of bronze forgings and special seamless tubing constructed to withstand severe service. It is evenly balanced. The high-pressure oxygen is controlled by



Milburn Type LPG Oxy-Illuminating Gas Cutting Torch

means of a thumb valve which remains fixed in an open or closed position. The gas tubes are so placed as to give the torch considerable transverse strength. The torch is supplied with a range of tips to accommodate all thicknesses of metal. These tips are made of solid copper, and are designed to rapidly preheat the gases, thus giving better penetration and quicker cutting.

Hall Model X Cylinder Hone

The Hall Manufacturing Co., Toledo, Ohio, is marketing the model X cylinder hone shown in the accompanying illustration. This hone combines both the positive-set type and the spring-actuated type. The pressure may be changed from spring to solid or back again without removing the hone from the cylinder or the driving drill from the hone. Because of this feature, it is claimed that it is impossible with this tool to finish a cylinder out of parallel.

Precision-ground cones sliding on a main shaft actuate the pivoted stone carrier arms and thus apply equal pressure on all four stones. The main body of the machine is a die casting made from a nickel-base alloy which has a tensile strength of approximately 39,000 lb. per sq.in., so that it is practically as rigid as cast steel.

Hall Model X Cylinder Hone

It is recommended that a standard $\frac{3}{8}$-in. portable electric drill be used to drive the hone, although it is said that a $\frac{1}{2}$-in. drill is capable of driving it due to the improved construction.

IXL Type HG Worm Gear Speed Reducers

An improved line of IXL type HG wormgear speed reducers has been placed on the market by the Foote Bros. Gear & Machine Co., 215 N. Curtis St., Chicago, Ill. The units are made in sizes ranging from fractional horsepower up to 200 hp. and in ratios of reduction ranging from 4 to 1 up to 100 to 1 for the single-unit type, and up to as high as 10,000 to 1 for the double-reduction type.

High-grade ball and roller bearings are used to take care of both the radial and thrust loads on the worm and wormgear. In the case of the worm, a double-row, deep-grooved ball bearing is used to carry both the radial and the thrust load. The wheel thrust, however, is carried on a standard plate-type ball thrust bearing.

A special form of tooth design is employed. Special tools and equipment have been used to insure extreme accuracy in the production of the worm and gears. The worm wheels are made of chilled cast bronze that is said to give exceptional strength and wearing qualities with a low coefficient of friction. The worms are made from nickel steel, casehardened, ground and polished so as to insure efficient tooth contact and quietness in operation.

Four general types are provided; with the worm below the gear, above the gear, with the worm shaft in a vertical position, and a combination of two units making a double reduction. For the same capacity and ratio, all parts of the different types are interchangeable, with the exception of the cases.

Frew Profiling Machine

The machine shown in the accompanying illustration has been brought out by the Frew Machine Co., 124 West Venango St., Philadelphia, Pa., for performing profiling operations on wood or similar material where a high spindle speed is required. The standard spindle speed is 3,500 r.p.m.,

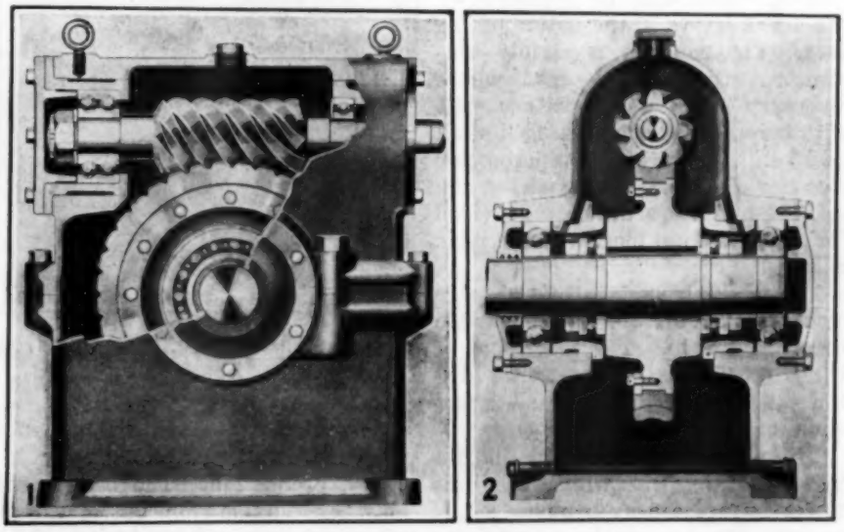


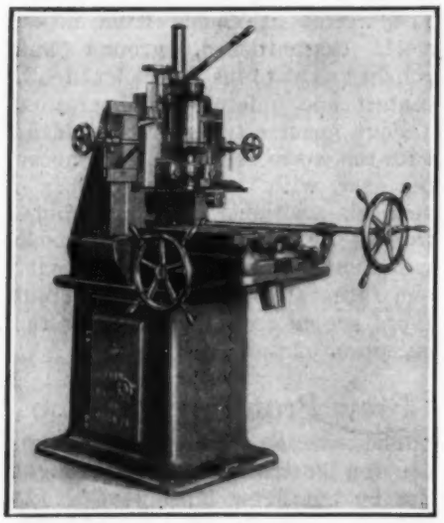
Fig. 1—IXL Type HG Wormgear Speed Reducers. Fig. 2—Mounting of the wormwheel

Shop Equipment News

but the speed can be increased to 7,000 r.p.m. through the use of a frequency changer whenever this is desired by the user.

The motor rotor is pressed directly on the spindle and is rated at 1½ hp. at 3,500 r.p.m. The spindle is carried in deep-groove precision ball bearings which carry both the radial and thrust loads imposed on the spindle. Arrangements are provided for the air-cooling of the spindle-driving motor so that there will be no tendency for it to overheat when operated at a high speed and under a heavy load on deep cuts.

As can be seen in the illustration,



Frew Profiling Machine

the movement of the table and of the cross slide are controlled by hand-wheels, which can be replaced by ball crank levers at the option of the user. The machine is rigidly constructed throughout, and where necessary gears and racks are split with adjustment for taking up all backlash. There is a micrometer stop for the vertical motion of the spindle, and stops are also provided for the in and out motion of the table and on the cross-slide.

The working surface of the table measures 12x15½ in. and the table travel is 15½ in. The movement of the cross-slide is 13 in. and the distance from the table to the cross-slide is 5½ inches.

This machine is also built for metal working, in which case the motor is replaced by a pulley, or, if desired, a motor can be supplied for driving the spindle through spiral bevel gearing.

Whitney No. 60 Notcher and No. 61 Bender

The Whitney Metal Tool Co., Rockford, Ill., has brought out two tools for working 3x3x⅜-in. angle

Fig. 1—Whitney No. 60 Angle Iron Notcher

iron or smaller. The No. 60 angle iron miter notching machine is shown above in Fig. 1, while below in Fig. 2 the No. 61 angle iron bending machine is shown.

Each of these units is furnished

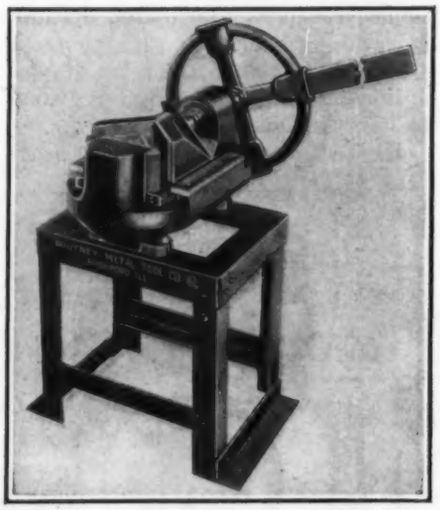


Fig. 2—Whitney No. 61 Angle Iron Bender

complete with a stand and a hand-wheel, which is said to greatly increase production. The bender not only bends angle iron, but by means of special jaws will bend pipes, flats, rounds, rods, T-irons, and other varieties of cross-section.

Trade Catalogs

Garage Equipment. The Hobart Bros. Co., Troy, Ohio, has available for distribution several leaflets describing various equipment for use in garages. This line comprises a battery-charging outfit, an automatic air compressor, a trouble shooter, and a test bench.

Heat-Treatment. The Automatic and Electric Furnaces, Ltd., 173 Farrington Road, London E. C. I., England, has published bulletin No. 37 on the above subject, entitled "Theory and Practice in the Hardening Shop." The bulletin is in the form of a 6-page leaflet and is divided into two parts, theory and practice. The treatment is entirely technical in character, and the publication is by no means an advertising circular.

"Jalcase." The Jones & Laughlin Steel Corporation, American Iron & Steel Works, Pittsburgh, Pa., has published a folder describing and illustrating uses of the alloy steel "Jalcase" in the automotive field, particularly in reference to gears and camshafts.

Lathes. The South Bend Lathe Works, South Bend, Ind., has published "Handbook No. 44 Showing 150 Shop Kinks for the Mechanic." This booklet contains thirty-two 6x9-in. pages and is profusely illustrated with photographs of the various set-ups described. The object of the booklet is to show some of the various sizes and types of South Bend lathes and their application in different types of shops. A line of small tools is also shown.

Speed Reduction Units. The Boston Gear Works Sales Co., Norfolk Downs (Quincy) Mass., has published a small 36-page booklet, No. C-1-27, on its wormgear speed reduction units. The various types are described and illustrated by means of halftones. Ratings, prices, and dimensional data are included.

Pamphlets Received

Wages and Hours of Labor in Foundries and Machine Shops, 1925. The U. S. Department of Labor, Bureau of Labor Statistics, Washington, D. C., has published bulletin No. 422 under the above title. This pamphlet contains one hundred and sixty 6x9-in. pages and is sold for 25 cents. Since the information contained is largely statistical, the presentation in general is in tabular form. In the first part, the data is summarized for comparison with 1923 figures. The information is divided into machine shops and foundries and is further classified under particular jobs. In other parts of the pamphlet figures for each state are given.

NEWS OF THE WEEK

Recovery of British Industry Is Slow After Disastrous Coal Strike

Machinery exports equalled the imports for last year

BY OUR LONDON CORRESPONDENT

FAITH is responsible more than anything else for the confidence that is generally expressed regarding industrial affairs in London. Few risks are being taken, and probably for that reason industry is not recovering at the speed predicted by many at the end of the coal dispute. The tardiness with which fuel prices are being reduced can be held responsible, directly or indirectly. Engineering schemes are thus held up, or at any rate are being developed at a much slower rate than had been expected, and machine tool firms are not receiving as many orders as some of the more optimistic among them had held to be likely. In particular heavy machinery has declined, and although the home railway companies are again in the market, they are slow to come to decisions. Some indications suggest that the first quarter of the year will extend the testing time.

FOREIGN BUYERS ACTIVE

Electrical firms have received orders in connection with various traction schemes in and outside Great Britain. The Indian railways in particular have been placing orders, and inquiries are in hand for equipment and rolling stock. Inquiries are also being received from South Africa and Japan. The demand for iron has increased and furnaces continue to be blown in, while steel works are handicapped by some lack of iron supplies.

British overseas trading last year showed some of the immediate effects of the long coal-mining dispute. Exports of home production totaled £651,892,504, a decline of more than 15 per cent as compared with the previous year, while imports totaled £1,242,863,679, a decline of less than 6 per cent, and re-exports, that is exports of imported merchandise, totaled £125,565,633, a decline of more than 18 per cent. Thus the net imports were valued at £1,117,298,046, giving a visible adverse balance of about 465¼ million pounds. Against this of course has to be placed the invisible exports, and until an official estimate is given of these, it is not possible to state whether the result of the year's trading is to be looked for on the right side of the national balance sheet. What apparently is being discovered is that, in the past, invisible exports have been underestimated, and, despite the disastrous strike, it is anticipated that the net results will not be quite unsatisfactory.

In the class known as machinery, Great Britain last year exported goods to the value of £45,537,756, this being a decline of more than 3½ million pounds, as compared with the previous year. Machine tools exported, though definitely in advance of 1924, weighed less than the 1925 exports—13,664 tons against 14,291 tons—the corresponding values being respectively £1,534,750 for 1926 and £1,561,338 for 1925. In imports, the machinery class accounted for £12,739,595, showing an increase of £839,222 in the year. Here machine tools amounted to 7,890 tons, against 5,480 tons in 1925, and 3,355 tons in 1924. It will be seen that the imports of machine tools showed a marked increase in weight as compared both with last year and the year before. The value figures also rose, but not in the same proportions, being £927,297 last year against £780,753 in 1925 and £553,542 in 1924. In re-exports, machinery was valued at £1,352,293, or about one-fifth million pounds lower than in 1925. Machine tools in this class weighed but 229 tons, valued at £41,589, and both in weight and value showed a decline as compared with the two previous years.

AMERICAN PRESSES COUNT

A noteworthy point is that, reckoned in ton values, the machine tool exports last year were almost equal to the imports. Thus the average imports were valued at about £117 per ton and exports at £112 per ton, while re-exports worked out at about £181 per ton. The decline in the ton values of imports is thought to be due in part to the importation of heavy presses from America. Export ton values have been maintained and even slightly increased, but corresponding import values showed a marked decline, the average ton value in 1925 being about £150. Re-exports in this class too have appreciated on this basis, the average in 1925 being £119 per ton; but the weights concerned are so small that the figures are apt to mislead. In imports, compared with machinery as a class, machine tools were of low value on the ton basis, namely, £117, as stated, against £160 for machinery generally. On the other hand, in exports machine tools were somewhat higher in ton value than the whole class of machinery, the relative figures being £112 and £96, while in re-exports, the average for machinery as a class was £232, against £181 for machine tools alone. It may be added that engineers' tools, including milling cutters, etc., were exported to the value last year of £636,506, which was more than the previous year.

The whole financial effect of the industrial troubles are not yet determined, but it is clear that the budget will show very little by way of surplus, even if it balances. The prospect of extra taxation has naturally alarmed manufacturers and industrialists generally, and they have been urging that direct taxation in the next fiscal year should in no case be increased, but that the loss of revenue resulting from the coal dispute should be regarded as capital loss, to be spread over a term of years. Railway rates, too, for merchandise traffic have been increased, and here again a handicap to trade expansion is anticipated. But there is solid evidence of improvement, at least in the immediate past, as the total number of unemployed persons have steadily declined, and cost of living estimates once again tend downwards, while it is felt that generally the purchasing power of the world is increasing.

S.A.E. Standards Are Indorsed at Detroit Conference

At a meeting in Detroit on Feb. 2 and 3, a special group of manufacturers, retailers and designers, brought together under the auspices of the Division of Simplified Practice of the Department of Commerce, indorsed the proposed standards on spark plugs, pistons, brake linings and roller bearings which had been prepared by a committee from the Society of Automotive Engineers.

While individual manufacturers of spark plugs have been producing on a simplified plan for several years, in conformity with the standards set up by the Society of Automotive Engineers in 1915, there has been no unified action on the part of the entire industry to confine its production to the standard sizes and types.

The desirability of establishing a standard list of brake-lining widths and thicknesses in order to concentrate production upon a minimum number of sizes, was expressed at a conference in Washington in December, 1924. A list was prepared by the Society of Automotive Engineers, and was indorsed by the gathering in Detroit.

The belief was emphasized by a representative group of manufacturers who convened at the Department of Commerce over a year ago, that simplification of roller bearings is not only practicable but desirable.

Many of the standards of this type, covering articles into the manufacture of which engineering skill enters, are already in general use. The Department of Commerce will urge the use of those standards now indorsed.

Chicago to Have New Engineering Home

Announcement was made a few weeks ago of the adoption of plans for the erection of a building in Chicago to house the engineering activities of that city. For many years the need for a center of engineering activity where engineering matters of all kinds can be liberally discussed has been apparent to the engineers of Chicago. A number of attempts have been made to supply this need but due to the difficulties of financing so large a project none of these attempts have matured until recently.

The proposed building will cost $6,000,000. The exterior will be of Bedford stone and the lobby will follow gothic design in accordance with the general scheme of architecture. The building will have a frontage of 100 ft. on Wells Street and 150 ft. on Wacker Drive. There will be three sub-basements. The floors below the upper level will be used for garage purposes so that tenants may have parking facilities for their cars.

The Western Society of Engineers has leased space representing nearly double the space it now occupies. This will permit of not only more adequate quarters for the offices and for the establishment of conference rooms, but will permit of better housing of the library, which is the largest engineering library west of New York City. National engineering societies, located in Chicago, have already leased space in the building, and local sections of societies whose national homes are located in other cities will hold their meetings in the new building. The Society of Industrial Engineers has leased space in the building. An auditorium, seating at least 500, will be provided for meetings. The societies located in the building will have the privilege of using this auditorium. A number of engineering firms have already signed up for space in other parts of the building.

Thomas Ewing Elected President of National Engineer Museum

The board of trustees of the National Museum of Engineering and Industry announces the election of new officers and a new program as the result of a meeting held in the New York headquarters of the American Institute of Electrical Engineers on Jan. 20. Up to this time efforts have been concentrated on a program to raise endowment funds. Hereafter efforts will be concentrated on holding together and increasing the membership until it is determined whether the fund-raising activities can be resumed with good augury. It was agreed that commendable progress had already been made, but that even so meritorious a movement as the establishing of a national museum of engineering and industry cannot succeed without the enthusiastic co-operation of the four founder societies.

Thomas Ewing was elected to the presidency of the trustees. Mr. Ewing is a former Commissioner of Patents, is eminent in the field of patent law and has wide knowledge of and sympathy with the engineering profession and the objects of the museum.

The complete list of the new officers follows: Thomas Ewing, president; vice-presidents, Edward G. Acheson, L. H. Baekeland, Charles F. Brush, Thomas A. Edison, Frank J. Sprague, Edward Weston, Orville Wright; H. F. J. Porter, consulting secretary; Harrison W. Craver, secretary; George E. Roberts, treasurer.

Psychologists Study the Mental Aptitude of Engineers

Fitting the worker to his job is not yet a science, Carl C. Brigham, associate professor of psychology at Princeton, declares in a report on the development of tests of aptitude in engineering at Cooper Union.

The psychologist, in contriving tests, is baffled at the outset by the absence of definite knowledge of what "engineering ability" is and how it can be measured, he points out.

"A job analysis of industry reveals little," Prof. Brigham says, "for there are as many kinds of engineers as there are hats."

Psychology is systematically attacking the problem, but so far has failed to find adequate support for the claims of personnel enthusiasts, according to the report, made public by the Cooper Union Board of Trustees, of which R. Fulton Cutting is president.

"The notion of the existence of special mental aptitudes for various types of occupations is an attractive one," Prof. Brigham adds. "If specific mental organizations could be demonstrated and their potency in causing vocational success shown, the proper placement of individuals in various occupations would be greatly simplified."

At the present time, the theory of specific vocational aptitudes finds most of its enthusiastic adherents among vocational advisers and personnel men engaged in the practical work of placing people in certain jobs.

Psychologists are much slower in accepting the theory without qualifications. There are many psychological problems involved which are entirely unsettled. Evidence is gradually being assembled on the problem, but no final answer is immediately available.

Study of Friction

Experiments are being carried on in the mechanical engineering department of the faculty of applied science at McGill University, Montreal, in an effort to measure the losses of power due to friction in machine bearings. The department of mechanical engineering is primarily concerned with the loss from friction in machine bearings. The present investigations are dealing with the relation existing between the friction and the running clearance, in addition to the load carrying capacity of the lubricant.

Eyesight Conservation Council Reports

L. W. Wallace of Washington, executive secretary of the American Engineering Council, has been re-elected president of the Eye Sight Conservation Council of America for 1927. Mr. Wallace was also chosen a member of the board of directors.

Guy A. Henry, of New York, was again named general director. Elections to the board of councillors include: James J. Davis, Secretary of Labor; Dr. Arthur L. Day, director of the Geophysical Laboratories of the Carnegie Institute of Washington; and Prof. Joseph W. Roe, head of the Department of Industrial Engineering, New York University.

"The Eye Sight Conservation Council," states the annual report of Mr. Henry, "has won unquestioned recognition as an authoritative source of information on all phases of eye conservation and is generally regarded as the logical agency to co-operate with education and industry in the furthering of national effort.

A chief accomplishment of the past year, the report said, was the completion under the direction of Joshua Eyre Hannum, member of the American Society of Mechanical Engineers, of an eyesight conservation survey, called the most comprehensive of its kind.

Another achievement of the council, the report pointed out, was the publication of a popular edition of the school lighting code by authorization of the sectional committee on school lighting of the American Engineering Standards Committee.

S.A.E. Standards Ready for Approval

The following reports of the standards committee divisions of the Society of Automotive Engineers, as submitted at the annual meeting in Detroit in January, have been acted upon at a meeting of the standards committee, and the reports and the action of the committee upon them were later approved at the council meeting and at the general meeting of members of the society at the same time.

The reports will now be submitted to a final letter ballot of the society and those that are approved by the ballots will be published in the March issue of the *S.A.E. Handbook*.

The standards now prepared for this final balloting are: Nomenclature covering four-wheel brakes, aeronautic specifications that promote interchangeability, electrical instrument mountings, lighting and starting circuits, wire colors, revised flywheel housings, engine-testing forms, crankcase drain-plugs, S. A. E. steels 2015 and 2115, manganese limits, Rockwell hardness test, heat-treatment of molybdenum steels, head-lamp strength and rigidity, bases, sockets and plugs, signal lamps, tail lamps, incandescent lamps, midship shaft mountings, flexible-disk tolerance, rod-end pins, rivets, capscrews, bolts and nuts, setscrew heads and jam nuts, T-slots, bolts, nuts and cutters.

Columbia Will Study Its Engineering Problems

Nicholas Murray Butler, president of Columbia University, has appointed a committee of alumni of the engineering schools to study from the point of view of the practicing engineers some of the present problems relative to engineering training and research and the duty and opportunity of Columbia University in regard to them.

With the rapid development of engineering instruction and engineering schools during the past generation, have come marked changes in the conditions which Columbia has to face. It is the established policy of the University to train not the great mass of professional practitioners in any field, but the educated leaders of the several professions. The personal and professional contacts that are possible in the City of New York for engineering students and research workers and the enormous stimulus that may be had from meeting the leaders of the engineering profession gathered here are all elements to be reckoned with.

The committee, which will report to President Butler for his information and for the use of the appropriate university authorities, is headed by Milton L. Cornell of the class of 1905. The other members are: Daniel E. Moran, Arthur S. Dwight, Gano Dunn, Francis Blossom, Harris K. Masters, Henry C. Carpenter, Richard E. Dougherty, Darwin S. Hudson, David M. Myers, Elihu C. Church, Milton L. Cornell, John J. Ryan, Roy U. Wood, Frederick W. Jewett and Stephen P. Burke.

The committee will conduct the study in consulation with the faculty of applied science, and with those trustees of the university who have been graduated in engineering. These include:

General William Barclay Parsons, Walter H. Aldridge, Frederick Coykendall and H. Hobart Porter.

Illinois Offers Graduate Research Work

To assist in the conduct of engineering research and to extend and strengthen the field of its graduate work in engineering, the University of Illinois maintains fourteen research graduate assistantships in the engineering experiment station. Two other such assistantships have been established under the patronage of the Illinois Gas Association. These assistantships, for each of which there is an annual stipend of $600 and freedom from all fees except the matriculation and diploma fees, are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics, or applied chemistry.

An appointment to the position of research graduate assistant is made and must be accepted for two consecutive collegiate years of ten months each, at the expiration of which period, if all requirements have been met, the degree of Master of Science will be conferred.

Nominations to these positions, accompanied by assignments to special departments of the engineering experiment station, are made from applications received by the director of the station each year not later than the first day of April.

Research work and graduate study may be undertaken in architecture, architectural engineering, ceramic engineering chemistry, civil engineering, electrical engineering, mechanical engineering, mining engineering, municipal and sanitary engineering, physics, railway engineering, and theoretical and applied mechanics.

No Metric Bill This Year

There is no disposition on the part of the Commerce Committee of the Senate to go further with its metric system hearings. Enough of the reasons against legislation which would require additional use of another system of weights and measures were presented to the committee to indicate that approval of the bills before it probably could not be secured.

Senator Jones feels that the matter is so well covered in the records of former hearings that he is not disposed to have the Senate incur the expense of printing the hearings which he conducted a few weeks ago.

Pan American Conference at Washington in May

Invitations have been issued to the Latin American countries asking them to send representatives to the Second Pan American Standardization Conference which is to be held in Washington early in May. While the arrangements have not been worked out in detail and no official announcement has been made as yet, it is understood that the emphasis will be placed on standardization for raw materials.

Every effort will be made at this conference to confine the work to specific needs which give promise of being definitely decided at this meeting. Certain standards for the following raw materials are to be discussed and as many as possible of them set up for practical use—cocoa, coffee, tobacco, wool, hides, fruits, and oleagineous seeds. Consideration also is to be given industrial engineering standardization.

Health Reports Available

The weekly public health reports of the United States Public Health Service are now available to all persons in the United States and its possessions also in Canada, Cuba, and Mexico, for the nominal subscription of $1.50 per year, it is announced in the current issue of the official bulletin of the Post Office Department. Subscriptions should be accompanied by money orders, and sent to the Superintendent of Documents, Government Printing Office, Washington.

Railway Tool Foremen Announce Topics

Arrangements have been completed by the program committee of the American Railway Tool Foremen's Association for the topics to be presented at the fifteenth annual convention of the association which is to be held in Chicago, Aug. 31, Sept. 1 and 2, instead of Sept. 7 to 9 as originally planned. A committee for each topic, consisting of a chairman and five members, has been selected. The topics to be presented are as follows:

"Standardization of Locomotive Taps and Dies," A. A. Ferguson, Missouri Pacific R.R., chairman; "Recommendations for Improving Railroad Work Through Standard Gage and Measuring Systems," M. B. Roderick, Erie R.R., chairman; "Heat-treating Methods and Equipment Recommended for Small and Large Railroad Shops," H. L. Taylor, Baltimore & Ohio R.R., chairman; and "Small Tools, Jigs and Devices for the Locomotive and Car Shops," M. Branch, Chesapeake & Ohio Ry., chairman.

Three New A.S.M.E. Investigations

At its meeting in Washington on Jan. 14 the Council of the American Society of Mechanical Engineers authorized the main research committee of the society to undertake three new projects. These are: The Practical Application of Airplane Dynamics in Design; Strength of Cylindrical Vessels Under Pressure; and, Absorption of Radiant Heat in Boiler Furnaces.

The first project was presented by the aeronautics division and has for its purpose the review and analysis of existing data on airplane dynamics.

The second project was suggested by the boiler code committee and deals with the strength of cylindrical vessels under pressure and has as its purpose the determination of methods of computation for strength of cylindrical surfaces under pressure.

The third project originated with individual members of the society. It will cover a careful study of the subject of radiant heat in boiler furnaces with the object of making recommendations for improved furnace design.

Exporters to Meet

The Export Managers' Club of New York will hold its annual get-together meeting in the Hotel Pennsylvania, New York, on March 22. The event will take the form of an all-day meeting, one session in the morning, one in the afternoon and an informal dinner in the evening. The subjects to be covered in the various sessions are: The Export Manager as a Sales Builder, Sales Research in Planning Selling Abroad, The Export Salesman, Credit to Foreign Buyers as a Sales Asset, The Relation of Export Sales to Major Policies of the Business, and The Place of Publicity in Export Selling. Oren O. Gallup, of the Ohlen-Bishop Co., 233 Broadway, New York, is secretary of the club.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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"CAN our prosperity last?" is a question asked in the London *Spectator* by an English journalist, Hamilton Fyfe, who recently visited the United States and went as far west as Iowa. He says that he found Cabinet members and captains of industry apprehensive that the "period of large profits, high wages and lavish spending may be near its end." But he adds that he could discover few signs of change, although he admits that there are some indications of a lessened demand for automobiles and of a contraction in building activity. The final answer that he gives to his question is conditional for he says that if in these two standard industries there is going to be anything approaching a slump, all other trades will be affected.

Many other observers are asking Mr. Fyfe's question, and some are answering it as he did. The fact that automobile production is still greatly curtailed is generally known and the slight decrease in projected building activity has received full mention. It is true that these connote smaller wage disbursements and lessened purchasing power that will affect other industries. But one swallow does not make a summer nor one month a year, and the automobile manufacturers report that where the shows are ended and the weather is good sales justify expectation of larger production in February and full time operation again by March. And if building is down a little the textile industry, and the coal business are up, and steel is climbing again if an increase in the number of blast furnaces in operation during January, and a spotted improvement in buying, are criterions. Therefore there has probably been no great loss yet in total purchasing power except in the case of the farmer.

But the chief reason for confidence that no more serious recession is likely than already exists is to be found in the money market. Since the New Year opened we have received more than $52,000,000 in gold and the resulting cheapness and abundance of credit makes it easy to absorb our economic slack and to market good investment securities. In the same period the discounts of the Federal Reserve Banks have been reduced more than $300,000,000, and as the member banks thus pay off their borrowings the declining tendency of money rates becomes more pronounced. The effect is particularly apparent in the bond market in which last week's offerings of approximately $300,000,000 made a new peace time record, while the total of new financing since January 1 exceeds $850,000,000. Much of this financing is undertaken in the belief that the present is a good time to refund loans made at higher rates.

These conditions are also reflected in the stock market where railroad securities have been strong and active upon the talk of consolidations, combinations and mergers that will give new value to properties that have not been conspicuously profitable in the past. But the public have not been participants in the resulting speculation. It is chiefly confined to operators who have been close students of the American railway map, and it can therefore be regarded as highly intelligent.

It may well be asked where all the money is coming from. In one form or another it is simply the savings of a fully employed and well-paid people. To mention only one source, the savings bank deposits of the United States are estimated at more than twenty-five billions, upon which interest at 4 per cent annually equals a billion dollars. Nearly all of this becomes available for investment. Then there are the life insurance companies whose investment power is illustrated by the interesting announcement made last week that one of them now has an income of $2,500,000 a day. It is commonly and truthfully said that no serious business depression can begin in such a period of easy money and experience confirms the belief that the recession now being experienced, although of unknown duration, will in reality prove to be only a welcome and agreeable breathing spell.

Trade reports are mixed. Mail order houses have ceased to show increases in their sales, bank clearings continue lower than a year ago and car loadings show an increase over 1926 only because coal traffic is so much heavier. This coal movement is due principally to accumulation of stocks in preparation for the strike or lock-out that seems inevitable when present wage agreements expire on April 1. That is the next crisis business must face, but fortunately warning has come in plenty of time and stocks plus non-union production will see the country safely through the short-lived suspension that seems probable.

The "burning issues" of Europe have burned themselves out and most of the news is encouraging, including the reduction in the French bankrate to 5½ per cent and the acquiescence of the German Nationalists in the government's foreign policies. In China, hopes that the offers of Great Britain, the United States and Japan to negotiate new treaties granting practically all demands made by all Chinese factions would result in a rapprochement of those factions have not been realized. But they point the way out and fears of a world catastrophe are definitely ended. That the United States will be further involved either there or in Mexico seems presently unlikely.

WHAT'S DOING IN INDUSTRY

THE PAST week has brought out no new development in the trend of machinery and machine tool business. Reports from large industrial centers indicate a period of reflection is at hand, and orders are less in volume than previous estimates had predicted. The inquiry mail, however, is holding up and is providing manufacturers and dealers with plenty of action and paper work.

CINCINNATI reports a slight improvement over the past week, with a few more sales and inquiries. Activity in Chicago has been lessened, but a few types of tools are in demand and some good sales are reported. Automotive, wood working and construction interests have been a little more active as buyers in the Indianapolis territory. Detroit is experiencing a slight decline in sales.

THE SOUTH reports a slight improvement, with prospects bright for an early resumption of buying by textile and construction industries. Business in New England is fairly good with inquiries holding up and most factories busy. The iron and steel and general construction industries in Canada promise some attractive business for machinery dealers in that country this spring. New York continues at an uncertain pace, only some small business being recorded last week.

THE CHIEF reason for confidence in general business is to be found in the money market. Investment and security activities are stable and credit is cheap and abundant.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CHICAGO

The machine tool market shows less activity than had been looked for with the advent of February. With the exception of planers, shapers and millers, which are in steady demand, machine tools are moving slowly. The month of January, as compared with the same month a year ago, is reported to be somewhat behind in the volume of business transacted. This applies to the larger tools of heavy-duty type. Trade in machinists' and electrical tools continues on the same good level that has characterized it for the last several months, and shows no signs of lessening. Used machinery is only in fair demand, and dealers are not expecting a much improved condition of the market for the next three or four weeks.

Inquiries continue to be received in satisfactory number, most of them, however, being of a tentative nature and having reference to indefinite future delivery. No buying of importance is reported as coming from railroad interests, and thus far this year no lists have been issued. As for several weeks past, general industry and machine shop owners are contributing by far the larger part of the business.

NEW YORK

Business continues at a rather uncertain pace in this market. The larger manufacturing units who have been the best customers of machine tool and machinery dealers have held up many orders that were expected to close in the past week. Some buying of miscellaneous equipment is being done by small shops, garages and radio parts manufacturers.

Toolroom equipment and hand tools have not experienced the same drop as the larger types of machinery. The crane market is slow. Orders for yard and shop material handling equipment are pending the decisions on many construction projects.

Among the buyers in this market in the past week might be mentioned: The National Tool Co., U. S. Aluminum Co., International Harvester, Refrigerator Specialty Co., Chas. Mundt, Merco-Nordstrum Valve Co., Victor Talking Machine Co., American Tool Manufacturing Co., the Illinois Steel Co., the New York Central and the Chicago, Milwaukee & St. Paul railroads.

CINCINNATI

Machine tool manufacturers in the Cincinnati district report that in the past week there has been some improvement in the market tone. A slight increase in sales is reported by the majority of manufacturers, comparing the week with the previous one, and in no case is a decrease reported.

Selling agents report an increase in demand during the past week, expressing confidence that the upward swing of the sales pendulum will continue. Out-of town buyers, it is stated, who desired to make purchases personally, visited the city in larger numbers than usual.

Inquiries came in freely, from all sections of the country, from all classes of users and for all classes of tools, large and small. Some lists were received, but most inquiries were for single tools and replacements.

The week's business was made up of orders for single tools and replacements. What is regarded as a very encouraging feature by makers rests in the fact that concerns that a short time ago bought single tools, for the purpose of trying out their efficiency, are sending in re-orders.

INDIANAPOLIS

A slight increase in demand for machinery and machine tools has been noticed in this territory during the past two weeks. One of the brightest spots is the automobile industry. If orders continue to be received during the next month as they have during the past, some factories will be compelled to increase their production. The new models put out by Indiana factories at the recent shows seem to have gone over big and every factory in the state is speeding up its production. The machine tool business is expected to be particularly good for this reason.

Demand for heavy lathes also is picking up, with inquiries heavier than they were at this time last year. From present indications this business will see an exceptionally good spring.

Early inquiries for contractors' equipment are being received. While a considerable volume of this business is expected, the demand from the building trades hardly will be as heavy as last year. However, road building equipment should have a ready sale this spring. The state highway department is making plans to pave more roads this year than last and much of the old war material turned over to the department is past its usefulness and must be replaced.

CANADA

While inquiries are few at present, machinery and machine tool dealers in Canada regard the situation as very promising and are looking for an upward swing in business within the next couple of weeks. The automotive and construction industries are both busy, and leaders in these fields say the year promises good business.

The farm implement and machinery industry is well employed. Thomas Bradshaw, general manager of the Massey-Harris Co. Ltd., recently reported that during 1926 the industry enjoyed a continuance of the improvement begun in 1925. The demand for all classes of farm implements, from the small hand tools up to the heavy power-driven units, was greater.

Railway orders still appear to be the chief factor in the iron and steel industry. No announcements have been made by the railroads yet, but it is no secret that buying will be done on a considerable scale this year. Equipment companies expect to benefit greatly from this business. It is shown in government reports that during 1926 Canada's primary iron and steel industry showed considerable improvement in quantity production over the previous year, largely because of the pronounced prosperity of the construction and automotive industries.

Probably the brightest spot so far as the supply business is concerned is the warehouses. Call for material out of stock was maintained over the year end without a drop, and now is even better than late in December.

The hardware business is reported to have shown a big improvement in every section of the Dominion since the beginning of the year. In western Canada there is every indication of exceptionally good business in this line from now on.

NEW ENGLAND

Machinery builders in the southern New England section agree that business is good, with orders coming in steadily and sustaining the belief in favorable business conditions for the first half of the year. Here and there, however, statements are made that conditions are "not so good," but this sentiment is expressed chiefly by smaller manufacturers. The business booked represents practically all lines of industry, more recently favoring the railroads and the electrical industry. The volume of inquiry mail is good.

Skilled labor is in demand, especially in Bridgeport and Hartford, where additions to working forces are being made. Throughout the section expert mechanics are readily employed.

Demand for machinery for export delivery improved in the past two weeks. Small tool trade is less active.

SOUTHERN DISTRICT

Machinery and tool sales in this territory improved slightly toward the end of January, the month as a whole being about on a par with the January of 1926. The inquiry in the latter part of the month picked up considerably, and indications are that February business will show a gain over that month in 1926, while business for the first quarter promises to be normal.

Because of the large amount of textile mill construction this line is showing particular activity, and though orders are not yet on a large basis, the inquiry is equally as good as the late summer of 1926, when unusually good business was enjoyed. For the same reason the demand from furniture makers for woodworking machinery also has been improving steadily the past two or three weeks, with the inquiry giving promise of better than normal business the next few months.

Road machinery call is beginning to open up a little, and is expected to be showing improvement steadily from now on, with at least a normal business in prospect. Inquiry from railroads is fair and normal business is in promise, but sales have not as yet opened up on any appreciable basis.

DETROIT

Sales of machinery and machine tools have shown a slight decline during the past week, but from the inquiries received and the programs planned by manufacturing establishments a change for the better should take place soon. As a whole, the business since the first of the year has been fair. One manufacturer's representative declares that he will be well satisfied if business continues at the present rate throughout 1927. Others are finding little demand but even they admit that a material improvement will be noted before the end of February.

The conclusion of the last national automobile show will mean the resumption of full production on the part of many of the Detroit motor car plants which have been running on part time. At the present time Ford is running only about two and a half days a week, in contrast with the General Motors Corporation which is going full blast. There seems to be no appreciable market for used machine tools.

Name Committees for New Haven Show

Plans for the seventh annual machine tool exhibition to be held at the Mason Laboratory of Mechanical Engineering, Sheffield Scientific School, Yale University, Sept. 6, 7, 8 and 9, have just been announced. Prominent educators and manufacturers have been appointed to committees in charge of the exhibition.

Harry R. Westcott, of New Haven, has been chosen again as chairman. He will have the assistance of Ernest Hartford, of the American Society of Mechanical Engineers; J. D. Marsh, chief engineer of the Mason Laboratory; Samuel W. Dudley, professor of mechanical engineering in the Sheffield Scientific School; and Nelson H. Brooks, also of the Sheffield Scientific School. Owing to the increasing scope of the exhibition it has been decided to change from an annual affair to a biennial one, to be held in odd years, beginning with 1927.

ADVISORY BODY

The advisory committee for the 1927 exhibition is made up as follows:

James A. Hall, chairman, professor of mechanical engineering, Brown University; C. R. Burt, vice-president and general manager, the Pratt & Whitney Co.; F. H. Colvin, editor, *American Machinist;* J. N. Connolly, general manager, the Standard Machinery Co.; A. C. Cook, vice-president, the Warner & Swasey Co.; R. E. Flanders, manager, the Jones & Lamson Machine Co.; J. W. Hook, president, the Geometric Tool Co.; F. G. Hughes, vice-president, the New Departure Manufacturing Co.; K. F. Lees, the K. F. Lees Co.; W. W. Macon, managing editor, the *Iron Age;* E. Oberg, editor, *Machinery;* C. M. Pond, manager small tool works, the Pratt & Whitney Co.; M. Prentiss, secretary and treasurer, Henry Prentiss & Co.; C. W. Rice, secretary, American Society of Mechanical Engineers; G. R. Woods, manager, R. S. Stovkis & Sons.

Lou Wilson Retires

An event of widespread interest to the machine tool and machinery industry came to light on Feb. 1 with the announcement of the retirement from active business of George L. Wilson. "Louie," as he is known to manufacturers, dealers and others in the trade, has been associated with this industry for 45 years, all of which time has been spent with Henry Prentiss & Co., of New York.

Mr. Wilson joined Henry Prentiss in 1882, as a clerk, when he was 14 years old. He soon adapted himself to the business of selling machine tools and later became a salesman. He was active in the formation of the Machinery Club and served on the board of governors and in other capacities.

Mr. Wilson has no particular plans for the future, except that he will try to do some of the things, and see some of the places, that close application to business has forced him to neglect in the past.

Business Items

The Arthur Jackson Machine Tool Co., of Toronto, Canada, will move its offices on March first to 32-34 Front St., in Toronto.

The Cleveland Planer Co. has taken over the manufacture of the Woodward crank planer, 24 in. and 36 in., formerly built by the Woodward & Powell Co., of Worcester, Mass. Repair parts and servicing will also be provided by the Cleveland company.

The Federal Machinery Sales Co., of Chicago, has moved from 12 N. Jefferson St., to 17 S. Jefferson St., which premises were formerly occupied by Marshall & Huschart Machinery Co.

The Société Anonyme Alfred Herbert, Paris, France, has recently moved to new quarters at Faybourg Poissionniere and Rue du Delta, in Paris. This location is in the center of the machinery district of Paris.

The National-Harris Wire Co. has been organized, taking in the former Harris Alloys, Inc., the National Alloyed Metals Co., and the Murray-Harris Wire Co. Headquarters of the new company are at 605 N. Third St., Newark, N. J.

The Jessop Steel Co., of Hamilton, Ontario, and A. P. McNair, of Vancouver, British Columbia, have taken over the selling of the products of the Heppenstall Forge and Knife Co., of Pittsburgh, Pa., for Ontario and west to Vancouver.

The American Gear Co., of Georgia, has been organized and incorporated in Atlanta for the distribution of gears and machinery in the Southeast. Incorporators named include E. R. Byer, of Jackson, Ga., and James T. Wright, of Atlanta.

The Harriman Power Plant Corporation is reorganizing its plant at Torrington, Conn., and will manufacture a new type of oil burning engine, and machinery. The engine is described as of the Diesel type, burning a low grade of oil. Machinery is being installed.

Articles of incorporation have been filed in Indianapolis by the Wallace Machine and Tool Co., of Indianapolis. The company will do a general foundry and machine shop business. The incorporators are Frank B. Wallace, R. B. Wallace and R. E. Pavey.

Articles of incorporation have been filed by the Indiana Foundry Machine and Supply Co., at Brazil, Ind. The company will manufacture sawmill and wood working machinery. The incorporators are Henry L. Erlewine, Albert H. Loucks, Arthur J. Caipha, Edwin B. Smith and Oscar Erlewine.

E. F. Houghton & Co., of Philadelphia, manufacturers of leather belting and oils for textile plants, announce the opening of a new Southeastern office in the Healey Bldg., Atlanta, to handle the company's trade in the states of Georgia, Florida, Alabama and Tennessee. Benjamin S. Barker, Jr., and his brother, William Reynolds Barker, are in charge of the branch.

The Indian Motorcycle Co., Springfield, Mass., has acquired the patent and manufacturing rights, machinery, equipment and finished parts of the "Ace" motorcycle, recently manufactured by the Michigan Motors Co., of Detroit. These will be moved to Springfield, where it is announced that the Indian and Ace lines will both be manufactured henceforth. This gives the Indian a four-cylinder line, in addition to the one-cylinder and two-cylinder lines it has hitherto produced.

The buildings and land of the Springfield Body Corporation, Springfield, Mass., were bought at a public auction sale by A. C. Dickinson of Fitchburg, Mass. For some months past Mr. Dickinson has been interested in getting this property for the Sikorsky Manufacturing Co., builders of airplanes, but it appears that no arrangements have been made as yet for passing it to that concern, though came only a day or two before the sale that the company, in which Mr. Dickinson is said to be a stockholder, was still interested in the possibility of obtaining the property for its use. The main building is of brick and steel and contains about 70,000 sq.ft. of floor space. There are several smaller buildings, one of them for kiln drying, and about five acres of land. A spur track of the Boston & Albany R.R. runs to the plant. Some machinery and tools still remaining at the plant were sold separately.

The annual sales convention of the Independent Pneumatic Tool Co., was held during the week of Jan. 17 at the home plant of the company in Aurora, Ill., and at the general offices in Chicago. Those attending the convention were: R. S. Cooper, vice-president; F. W. Buchanan, secretary; R. T. Scott, vice-president, New York; H. Keller, manager New York office; H. White, manager Cleveland office; A. L. Schuhl, manager Philadelphia office; F. Passine, manager Pittsburgh office; J. P. Fletcher, manager Buffalo office; H. Halbert, manager Birmingham office; V. W. Robinson, manager Detroit office; W. A. Nugent, manager St. Louis office; R. E. Kelly, manager Boston office; G. H. Du Sell, manager Milwaukee office; C. E. Fowler, manager Toronto office; W. H. Rosevear, manager Montreal office; Adolph Anderson, O. Dallman, J. G. Cowell, E. C. Neacy, E. McKinney, and F. R. Pfaff, of Chicago office; F. B. Hammerly, works manager; A. Levedahl, chief engineer; R. A. Norling, chief designer, and W. Levedahl, metallurgist.

Obituaries

JOHN KELSEY, founder and president of the Kelsey Wheel Co., of Detroit, died at his home on Jan. 19.

HENRY BRADFORD SARGENT, president of the Sargent Hardware Co., of New Haven, Conn., died in that city on Feb. 3. He was 76 years old.

IRA SHANNON DOWNING, 58 years old, general master car builder of the Big Four R.R., in Indianapolis, died recently in a hospital following a brief illness.

CHARLES DEERING, chairman of the board of directors of the International Harvester Co. until his retirement several years ago, died at his winter home in Miami, Florida, on Feb. 5. He was 75 years old.

SHIRAS MORRIS, president of Hart & Hegeman Manufacturing Co., Hartford, Conn., of which he was also treasurer, and who was also prominently identified with other Hartford industrial companies, died on Feb. 2. Mr. Morris was a director of the Billings & Spencer Co., the Terry Steam Turbine Co., the Bristol Brass Corporation, Sesamee Lock Co., the Sesecure Lock Co., the Bush Manufacturing Co., and Peck, Stow & Wilcox.

JOHN W. WESTON, a noted engineer, and for the last fifty years a member of the Western Society of Engineers, died on Jan. 25, at Oklahoma City, Okla., aged 82. Mr. Weston was instrumental in organizing the first congress of engineers ever held in America, which convened during the Chicago World's Fair of 1893. He retired from active engineering work during the eighties, and became the publisher of the *American Engineer.*

J. W. JOHNSON, 58 years old, Kokomo, Ind., long associated with the iron, steel and non-ferrous metal industry in that city, died recently in that city. Beginning work as a molder in one of the factories of which he later became the head, Mr. Johnson continued until he became the leader of seven successful businesses in Kokomo. They are: Byrne Kingston Co., Kokomo Electric Co., Kokomo Stamped Metal Co., Hoosier Iron Works, Malleable Iron Works, the Kokomo Brass Works and the Kokomo Lithograph Co.

MATTHEW J. O'NEILL, formerly treasurer and general manager of the Industrial Press of New York, publishers of *Machinery,* and for twenty-six years actively connected therewith, died on Feb. 3, last, after a long illness. Mr. O'Neill joined that organization in 1898 and to it his unusual business ability and untiring energy were invaluable. In 1924 Mr. O'Neill withdrew from the Industrial Press for the purpose of establishing a business of his own, and purchased the *American Printer,* which he owned at the time of his death.

Personals

H. D. MIXER has been appointed assistant sales manager of the axle division of the Eaton Axle and Spring Co.

HENRY E. ALDRICH has been appointed general manager of the Wickes Boiler Co., Saginaw, Mich.

WILLIAM C. PROCTOR, president of the Proctor & Gamble Co., has been elected a director of the New York Central R.R.

EARL H. SMITH has been appointed superintendent of engineering of the Olds Motor Works.

W. R. TRACY has been appointed vice-president in charge of sales for the Oakland Motor Car Co.

GEORGE H. WALSH has been appointed manager of the Boston sales office of the Dings Magnetic Separator Co., of Chicago.

G. E. STROHM has been appointed manager of the Detroit office of the National Spring and Wire Co., of Grand Rapids, Mich.

PAUL W. SEILER has been elected president of the Yellow Truck and Coach Manufacturing Co. He was formerly president of the Ternstedt Manufacturing Co.

J. T. WALLIS, chief of motive power for the Pennsylvania R.R., has been appointed assistant vice-president in charge of operations.

S. G. MORRIS, formerly connected with the Bourne-Fuller Co., is now associated with the Cleveland Duplex Machinery Co., as sales engineer.

LOUIS B. SEIDMAN announces that he is now engaged in the practice of engineering law at 1440 Broadway, New York City.

W. M. OLSEN has been appointed manager of the Detroit office of the Lamson & Sessions Co., of Cleveland. He was formerly with the Kirk-Latty Manufacturing Co.

C. M. WHITE has been appointed assistant general superintendent in charge of the tin plate, rod, pipe and tube departments of the Jones & Laughlin Steel Corporation.

JOHN A. NELSON has been appointed chief metallurgist for the Braeburn Alloy Steel Corporation, of Braeburn, Pa. Mr. Nelson was formerly associated with the Barber-Colman Co., of Rockford, Ill.

C. J. STETTLER has been appointed president and general manager of the Muncie Galvanizing and Manufacturing Co., of Muncie, Ind. He was formerly superintendent of the galvanizing division of the Dayton Pump and Manufacturing. Co.

THOMAS HOOPS, treasurer of the Welker-Hoops Manufacturing Co., manufacturer of automotive parts, at Middletown, Conn., has resigned as treasurer. Secretary Charles A. Russell has been elected his successor.

LOUIS E. BAUER, formerly vice-president of the Bauer Bros. Co., manufacturers of crushing, grinding and separating machinery, has removed to Springfield, Mass., where he is chairman of the board of directors of the Indian Motorcycle Co.

LAWRENCE WOOD has been appointed general sales manager for the Colonial Steel Co., of Pittsburgh. Mr. Lawrence has been associated with this company since 1912, having been district manager in Pittsburgh, in Detroit, and also assistant sales manager.

J. A. BROSSART, former superintendent of the car department at the Beech Grove shops of the Big Four R.R., in Indianapolis, has been named general master car builder of the road to fill the vacancy caused by the recent death of I. S. Downing.

LUCIUS ROSSITER, formerly vice-president and treasurer of the Terry Steam Turbine Co., Hartford, Conn., has been elected president to succeed Douglas Thomson, deceased. Mr. Rossiter joined the Terry company as assistant sales manager in 1913. He is a member of the board of directors of the Sesamee Lock Co., of Hartford.

Calendar of Local Meetings

A.S.M.E.

Detroit. Feb. 16. Detroit Engineering Society. "Purchasing vs. Engineering," by E. T. Gushee, Detroit-Edison Co.

Newark. March 28. Down Town Club, Newark, N. J. Sectional meeting of the Machine Shop Practice Division. "Plant Maintenance," by G. H. Ashman, of the General Electric Co.

Society of Automotive Engineers

Metropolitan Section. Feb. 17. "Buses," by R. N. Graham.

Detroit Section. Feb. 17. "Electro-Deposition of Rubber," by Dr. S. E. Sheppard and J. W. Schade.

National Association of Cost Accountants

Boston Chapter. Feb. 17. "Operating Costs and Radio in the Paper Industry and Methods of Determining Them," by Clyde Morgan.

Buffalo Chapter. Feb. 24. "Distribution of Selling Expense by Class of Product and Territories," by Albert E. Grover; and "Essential Records for Management," by George Frampton.

Chicago Chapter. Feb. 17. "Application of Factory Expense in Standard Costs," by Prof. David Himmelblau.

Cleveland Chapter. Feb. 16. "Should Interest on Investment be Included in Cost," by U. F. Von Rosen.

Detroit Chapter. Feb. 24. "Cost Accounting as a Basis for Shaping Operating Policy," by A. W. Bass.

Erie Chapter. Feb. 21. "Problems of Departmental Cost," by C. R. Stevenson.

Hartford Chapter. Feb. 15. Debate on subjects of mutual interest between purchasing agents and cost accountants.

Kansas City Chapter. Feb. 21. "Predetermined vs. Actual Costs in Loss and Gain Statement."

Los Angeles Chapter. Feb. 15. "Taxes (Income), Other Taxes and Their Distribution to Costs."

Milwaukee Chapter. Feb. 17. "Important Points on the Federal and State Income Tax Laws," by L. A. Lecher.

Philadelphia Chapter. Feb. 18. "Some Faults of Present Cost Systems."

Pittsburgh Chapter. Feb. 16. "Executive Budgets," by Herbert A. Gidney.

Providence Chapter. Feb. 14. "That the Least Important Function of Industrial Accounting Is the Determination of Costs for the Setting of Selling Prices," by W. H. Segar.

Rochester Chapter. Feb. 16. "Accounting for Capital Assets," by Kenneth Richmond.

St. Louis Chapter. Feb. 15. "Relation of Costs to Bank Credits," by H. F. Boettler.

San Francisco Chapter. Feb. 28. "The Determination, Classification and Distribution of Administrative and Selling Costs."

Springfield Chapter. Feb. 16. "Distribution of Selling and Arministrative Costs," by F. L. Sweetser.

Syracuse Chapter. Feb. 15. "Specific Applications of Standard Cost," by A. Ross Burley.

Twin Cities Chapter. Feb. 15. "Business Management of the Minneapolis School System," by Geo. F. Womrath; and "How-We-Do-It in Banks," by Charles H. Preston.

Utica Chapter. Feb. 21. "Cost of Distribution or Selling, and Administrative Costs," by L. E. Vannais.

Forthcoming Meetings

American Management Association. Winter convention, Hotel Pennsylvania, New York, Feb. 15 and 16. W. J. Donald, secretary, 20 Vesey St., New York.

American Railway Association. Engineering Division, March 8 to 10, at Chicago; Mechanical Division, June 7 to 10, at Montreal; Purchases and Stores Division, date and place not yet announced. H. J. Forster, secretary, 30 Vesey St., New York City.

American Society for Testing Materials. Spring group meetings of standing committees, at Philadelphia, March 15 to 18. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia.

American Society of Mechanical Engineers. Regional meeting, Kansas City, Mo., April 4 to 6. C. E. Davies, secretary in charge of meetings, 29 West 39th St., New York.

American Society for Steel Treating. Spring sectional meeting, Milwaukee, Wis., May 19 and 20. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Society of Mechanical Engineers. Semi-annual meeting, White Sulphur Springs, W. Va., May 23 to 26. C. E. Davies, secretary in charge of meetings, 29 West 39th St., New York.

National Foreign Trade Council. Fourteenth national foreign trade convention, Hotel Statler, Detroit, Mich., May 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

Society of Industrial Engineers. Annual meeting, Hotel Stevens, Chicago, May 25, 26 and 27. George C. Dent, secretary, 608 S. Dearborn St., Chicago, Ill.

National Association of Purchasing Agents. Annual meeting and "Informashow" at Grand Rapids, Mich., June 6 to 9. W. L. Chandler, secretary, Woolworth Bldg., New York City.

American Foundrymen's Association. Annual convention, Edgewater Beach, Chicago, June 6 to 10. R. E. Kennedy, secretary, 909 W. California St., Urbana, Ill.

National Supply and Machinery Distributors' Association. Twenty-second annual convention with the **Southern Supply and Machinery Dealers' Association**, and the **American Supply and Machinery Manufacturers' Association**, on board the steamship *Noronic*. Boat leaves Detroit, Mich., June 13 and returns there June 17. George A. Fernley, secretary, 505 Arch St., Philadelphia.

American Society for Testing Materials. Annual meeting at French Lick, Ind., June 20 to 24. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia.

American Railway Tool Foremen's Association. Fifteenth annual meeting, Hotel Sherman, Chicago, Aug. 31, Sept. 1 and 2. G. G. Macina, secretary, 11,402 Calumet Ave., Chicago.

American Society for Steel Treating. Ninth annual convention and national steel exposition, Detroit, week of Sept. 19. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

National Machine Tool Builders' Association. First exposition of machine tools at Public Hall, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, chairman of the exposition committee. Roberts Everett, manager, 1328 Broadway, New York City.

The Weekly Price Guide

Rise and Fall of the Market

THE price trend is definitely downward in iron and steel and one or two of the non-ferrous metals, such as zinc and copper. Semi-finished steel and wire rods recently dropped $2 per ton. Lead sales were brisk up to Feb. 4, while the Chinese political situation has had the effect of making antimony scarce and, to a certain extent, tin also. The situation in the finished products for use in shops differs slightly from that of the raw metal. Steel plates, bolts, nuts, strips and sheets show visible improvement in demand. The same is true of steel pipe, railway and automotive material.

(All prices as of Feb. 4)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$22.19
Northern Basic	20.89
Southern Ohio No. 2	21.39
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	18.50@19.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	23.26
Virginia No. 2	28.17
Basic	21.76
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	24.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.76
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00@4.50
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.15@2.30	3.50	3.15	3.89
No. 12	2.20@2.35	3.55	3.20	3.94
No. 14	2.25@2.40	3.60	3.25	3.99
No. 16	2.35@2.50	3.70	3.35	4.09
Black				
Nos. 18 to 20	2.90@2.95	3.75	3.25	4.15
No. 22	3.05@3.10	3.90	3.40	4.30
No. 24	3.10@3.15	3.95	3.45	4.35
No. 26	3.20@3.25	4.05	3.55	4.45
No. 28	3.35@3.40	4.20	4.70	4.60
Galvanized				
No. 10	3.05@3.15	4.10	3.95	4.40
Nos. 12 to 14	3.15@3.25	4.20	4.05	4.50
No. 16	3.25@3.35	4.30	4.15	4.60
No. 18	3.40@3.50	4.45	4.30	4.75
No. 20	3.55@3.65	4.60	4.45	4.90
No. 22	3.60@3.70	4.65	4.50	4.95
No. 24	3.75@3.85	4.80	4.65	5.10
No. 26	4.00@4.10	5.05	4.90	5.35
No. 28	4.25@4.35	5.30	5.15	5.60

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness — Decimal	B.W.G. and Fractions	Outside Diameter in Inches — ¼	⅜	½	¾	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or 125"	11	.23	.25	.27	.28	.29	.31	.33
134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	4.50	6.00@7.50	4.65
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.90@3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅛, 8.35c.; ¼, 7.85c.; 5/16 to ½, 7.35c. per lb. *Flat, ⅛@½-in. thick.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.00
Tin, 5-ton lots, New York			68.75
Lead (up to carlots) E. St. Louis	7 22½	New York	8.00
Zinc (up to carlots) E. St. Louis	6.57½	New York	7.50

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	16.50	18.50	16.00
Copper sheets, base	21.75	21.75	21.75
Copper wire, base	18.75	18.75	15.37½
Copper bars, base	21.37½	21.37½	21.37½
Copper tubing, base	23.75	23.75	23.75
Brass sheets, high, base	18.12½	18.12½	18.12½
Brass tubing, high, base	23.00	23.00	22.50
Brass rods, high, base	15.87½	15.87½	15.87½
Brass wire, high, base	18.62½	18.75	18.62½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	27.00	26.02
Zinc sheets (casks)	13.00	12.30	11.36
Solder (½ and ½), (case lots)	40.12½	43.50	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			84.00
Commercial genuine, intermediate grade			61.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			13.25
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35.00 Electrolytic 39.00 Shot			36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.25 @11.50	11.00	10.25@10.75
Copper, heavy, and wire	10.50 @11.00	11.25	9.50@10.00
Copper, light, and bottoms	9 25 @ 9.50	9.50	8.50@ 9.00
Heavy lead	6 25 @ 6.50	6.25	5.50@ 6 00
Tea lead	4.25 @ 4.50	4.25	4.50@ 5.00
Brass, heavy, yellow	6.75 @ 7.25	7.25	6.50@ 7.00
Brass, heavy, red	9.00 @ 9.50	9.25	8.50@ 9.00
Brass, light	5.25 @ 5.50	5.75	5.75@ 6.25
No. 1 yellow rod turnings	7.25 @ 7.75	7.50	7.00@ 7.50
Zinc	4.00 @ 4.12½	4.00	3.00@ 3.50

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	6.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13@0.17½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.13	.12@.17
Wiping cloths, washed white, per lb	.17½	36.00 per M	15
Sal soda, per 175 lb. keg	2.80	2.75	2.75
Roll sulphur, per lb	.04	.03½	.04
Linseed oil, per 7½-lb. gal., 5 bbl. lots	.84½	.98	.85
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.55	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.33	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.1587½	.1637½	.1662½
Solder (½ and ½)	per lb.	.4012½	.41	.3925
Cotton waste	per lb.	.13@17½	.13@.17½	15@22
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	7.00
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.33	35	.35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in.	off list	40%	40%	40%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.40	$5.84	$5.13
Emery paper	10.71	11.00	10.71
Emery cloth	27.84	31.12	27.84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1 32	1.45	1.32
Cloth	3.10	3.50	3.05
Fire clay, per 100 lb. bag		.75	75
Coke, prompt furnace, per net ton		Connellsville,	3.50@4.00
Coke, prompt foundry, per net ton		Connellsville,	4.50@5.50
White lead, dry or in oil,	100 lb. kegs	New York,	15.25
Red lead, dry	100 lb. kegs	New York,	15.25
Red lead, in oil	100 lb. kegs	New York,	16.75

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1¼ and 1½x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{7}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ½x½-in., 2c. each. Discount 70% for $\frac{7}{16}$-in and smaller and 65% for ½-in. and larger.
Case hardened ½x½-in., 6c. each, less 50%.

Rivets, button heads, ¾-in., ½-in., 1-in. diam. x2$\frac{7}{16}$-in. to 4½-in $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all diameters, 25c.; ½-in. dia., 35c.; ½-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb. 50c.; countersunk heads, 45c

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ½-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Equipment Wanted

Mass., Boston—H. Bernstein, 11 Beacon St.—miscellaneous tools and equipment for proposed 1 story, 90 x 220 ft. repair and service garage on Medford St. Estimated cost $75,000.

Mass., Boston—Hesse Machine Co., 1 Rowes Wharf—screw presses and power presses.

Mo., St. Louis — G. J. Dietz, Supply Comr., City Hall, will receive bids until Feb. 18 for two 20 ton electric travelling cranes.

O., Dayton—Holman Plating Co., 815 East Fifth St., W. Holman, Pres.—plating and metal spinning equipment for new shop.

Tex., Orange—Texas Tie & Lumber Co., Beaumont—machinery and equipment for proposed saw mill here. Estimated cost $40,000.

Tex., Wichita Falls—River Side Boiler & Welding Co., Inc., Box 1162, 115 Bridge St.—bending rolls, drill presses, grinders, power punches, shears, etc., for boiler repair and acetylene and electric welding plant.

Ont., Burlington — Nelson Chandelier Works, S. Nelson, Purch. Agt., complete equipment for the manufacture of electric light fixtures, floor and table lamps, in wrought iron, bronze and silver, also fireplace furniture, for proposed new plant.

Ont., Hamilton — D. Aitchison Lumber Co., 98 Main St. W.—complete woodworking machinery for proposed new planing mills to replace fire loss. Estimated cost $85,000.

Ont., Hamilton—City, H. A. Burrel, Chn. of Works Committee—complete machinery and equipment for proposed machine shop.

Ont., Toronto—Link-Belt Ltd., 265 Wellington St. W.—machinery and equipment for proposed new foundry and machine shop.

Que., Verdun—E. Charrette, 111 Chatham St., Montreal — complete machinery and equipment for garage and repair shop here.

Opportunities for Future Business

Calif., Los Angeles—Angeleus Furniture Mfg. Co., awarded contract for the construction of a 6 story, 177 x 200 ft. factory on East 9th St. Estimated cost $225,000.

Calif., Los Angeles—Auto Parking Terminal Corp., c/o R. E. Rose and S. Hanson, Haas Bldg., plans the construction of a 12 story, 120 x 165 ft. garage at 811 South Grand Ave. Estimated cost $150,000. Walker & Eisen, Western Pacific Bldg., Archts.

Calif., Los Angeles — F. C. Hill, Merchants National Bank Bldg., will soon award contract for the construction of a 12 story, 78 x 155 ft. garage at Spring, 4th and 5th Sts. Estimated cost $425,550. K. MacDonald, Jr., Spring Arcade Bldg., Archt. Noted Jan. 27.

Calif., San Diego—Bureau of Yards & Docks, Navy Dept., Washington, D. C., awarded contract for the construction of a machine shop and storage building at Naval Destroyer Repair Base here. Estimated cost $40,064.

Ill., Chicago—Chicago Tube & Iron Co., 2531 West 48th St., awarded contract for the construction of a 40 x 60 ft. addition to plant.

Ill., East St. Louis—Westcott Valve Co., 21st St. and Bond Ave., awarded contract for the construction of a 1 story, 100 x 200 ft. plant. Estimated cost $40,000. Noted Jan. 27.

Ind., Indianapolis—S. Cohen & Son, 140 West Vermont St., awarded contract for the construction of a 2 story, 100 x 136 ft. machine shop and service building. Estimated cost $45,000. Noted Jan. 6.

Ind., Indianapolis — Duesenberg Motor Co., 1511 West Washington St., is receiving bids for the construction of a 1 story, 70 x 320 ft. factory at 1500 West Washington St. Estimated cost $100,000. Private plans.

Ind., Indianapolis—W. F. Kernodle, 51 South Jackson St., Frankfort, is having plans prepared for the construction of a 6 story, 76 x 143 ft. garage at Kentucky and Maryland Sts. here. Estimated cost $150,000. R. Leonard, Peoples Life Bldg., Frankfort, Archt.

Ind., Indianapolis—Thornburg & Lewis, 1300 East Washington St., is receiving bids for the construction of a 2 story, 90 x 188 ft. machine shop and service building. Estimated cost $50,000. Doeppers & Lennox, 226 East Michigan St., Archts. Noted Jan. 6.

Ind., Michigan City—Royal Metal Mfg. Co., 2318 Southwestern Ave., Chicago, Ill., mnaufacturers of metal furniture, awarded contract for the construction of a 1 story factory, here. Estimated cost $65,000. Noted Jan. 27.

Ia., Des Moines—Automatic Garage Co., plans the construction of a 9 story, 66 x 132 ft. garage. Estimated cost $325,000. Sawyer & Watrous, 401 Southern Surety Bldg., Archts.

Mass., Chelsea (Boston P. O.) — New England Construction Co., D. Grossman, Spruce St., is having plans prepared for the construction of a 1 story repair and service garage at 90 Spruce St. Estimated cost $50,000 . S. S. Eisenberg, 46 Cornhill, Boston, Archt.

Mass., Dorchester (Boston P. O.)—Joseph Pollak Tool & Stamping Co. Inc., 81 Freeport St., awarded contract for the construction of a 3 story, 50 x 70 ft. addition to factory. Noted Jan. 13.

Mass., New Bedford—Hudson-Essex Motor Car Co., plans the construction of a 1 and 2 story addition to garage and repair shop at Kempton and Summer Sts. Estimated cost $40,000. E. M. Corbett, 70 Bedford St., Fall River, Archt.

Mass., Waltham (Boston P. O.)—J. L. Thomson Mfg. Co., Roberts St., will soon award contract for the construction of a 3 story, 50 x 125 ft. machine shop. Estimated cost $100,000. A. F. Gray, 53 State St., Boston, Archt.

Minn., Northfield—The Northfield Foundry & Machine Co. plans the construction of a 45 x 105 ft. addition to factory.

Mo., Kansas City—Kansas City Telephone Co., 11th and Oak Sts., will soon receive bids for the construction of a garage and warehouse at 34th St. and Roanoke Rd. Estimated cost $150,000. Private plans.

Mo., St. Louis — Bd. of Public Service, City Hall, will soon receive bids for the construction of a 3 story service building including garage and repair shop for fire department on Clark Ave. Esitmated cost $960,000. Study & Farrar, Arcade Bldg., Archts.

Mo., St. Louis — Century Electric Co., 1806 Pine St., is receiving bids for the construction of a 1 story, 109 x 124 ft. box factory at Pine and 19th Sts. Estimated cost $50,000. Klipstein & Rathman, 316 North 8th St., Archts.

Mo., St. Louis—Eternit Inc., 8200 North Broadway, manufacturers of asbestos shingles, lumber and corrugated roofing and siding, awarded contract for the construction of a 1 story, 56 x 180 ft. plant at 9049 Riverview Dr. Estimated cost $450,000.

Mo., St. Louis — The Koken Companies Inc., 2528 Texas Ave., manufacturers of barber supplies, awarded contract for the construction of a group of buildings including mill, shipping building, upholstery department, etc. on Morganford St. Estimated cost $160,000. Three additional buildings will be constructed later.

N. J., Elizabeth — Lidgewood Mfg. Co., 326 Frelinghuysen Ave., Newark, manufacturers of hoisting machinery, plans the construction of a plant here. Estimated cost $600,000.

N. Y., Long Island City—Dept. of Water Supply, Gas & Electricity, Municipal Bldg., New York, will soon award contract for the construction of a repair shop at Poyer St. and Barnewell Ave. here.

N. Y., New York—White Motor Co., W. T. White, Chn. of Bd. of Directors, 842 East 79th St., Cleveland, O., is having plans prepared for the construction of a 3 story sales and service station on East 133rd St. Estimated cost $200,000. Hughes & Conrad, Union Mortgage Bldg., Cleveland, O., Archts. H. R. Hadlow, c/o owner, Engr.

N. Y., Syracuse—City plans the construction of a 1 story, 60 x 200 ft. shop on Beech St. Estimated cost $70,000. M. Partridge, City Hall, Archt. N. F. Pitts, Jr., City Hall, Engr.

O., Cincinnati—Ninth St. Garage, 3131 Fairfield Ave., awarded contract for the construction of a 7 story, 100 x 140 ft. garage on Ninth St. Estimated cost $200,000.

O., Cincinnati—Schott Auto Co., 2416 Gilbert Ave., awarded contract for the construction of a 1 story, 50 x 150 ft. garage on Gilbert St. Estimated cost $165,000. Noted Dec. 30.

O., Cleveland—The Machine Products Co., E. H. Browning, V. Pres., & Secy., East 179th St. and St. Clair Ave., plans the construction of a factory. Estimated cost $50,000. Architect not selected.

O., Cleveland—Syndicate, c/o W. J. Wefel, 5716 Euclid Ave., Archt. and Engr., is having sketches made for the construction of a 12 story, 130 x 330 ft. garage, etc. Estimated cost $2,000,000.

O., East Cleveland (Cleveland P. O.)—W. J. Daubenspeck, 1371 East 115th St., Cleveland, awarded contract for the construction of a 1 story, 83 x 294 ft. garage at Euclid and Collamer Aves. here. Estimated cost $100,000.

O., Hubbard—Valley Iron & Mould Co., awarded contract for the construction of a plant. Estimated cost $750,000.

Ore., Portland—Pacific Properties Co., Gosco Bldg., is having plans prepared for the construction of a garage. Estimated cost $300,000.

Pa., Philadelphia—Preiss Nash Motor Co., plans the construction of a 2 story, 111 x 133 ft. sales and service station at Broad St. and Hunting Park. P. H. Tyre, 114 South 5th St., Archt.

Pa., Philadelphia—University of Pennsylvania, 34th and Spruce Sts., awarded contract for the construction of a 1 story, 40 x 93 ft. addition to machine shop at 36th and Walnut Sts.

R. I., Providence—City Hall Hardware Co., 150 Washington St., will soon award contract for the construction of a 6 story, 95 x 96 ft. factory at Snow and Washington Sts. Estimated cost $225,000. T. J. Pierce, 275 Washington St., Archt. Noted Mar. 25, 1926.

Wash., Seattle—Electric Products Corp. of Washington, H. F. Alexander, Pres., 1519 Railroad St., recently incorporated, plans the construction of a plant for the manufacture of outdoor illumination device, known as the Claude Neon light. Estimated cost $300,000.

Wis., Waukesha—Waukesha Motor Co., West St. Paul Ave., awarded contract for the construction of a 1 story, 90 x 155 ft. addition to shop. Estimated cost $50,000.

Ont., Hamilton — Gartshore - Thompson Pipe & Foundry Co. Ltd., is having plans prepared for the construction of a 1 story foundry. Estimated cost $150,000 to $200,000. Private plans.

Que., Three Rivers—Paper Machinery Ltd., c/o Canada Iron Co. Ltd., manufacturers of paper machines, plans the construction of a 2 story, 75 x 150 ft. plant on St. Maurice St. Estimated cost $200,000. L. W. G. Hellstrom, Engr.